LEVEL 4

Science Booklet

Agahi Public School________________________

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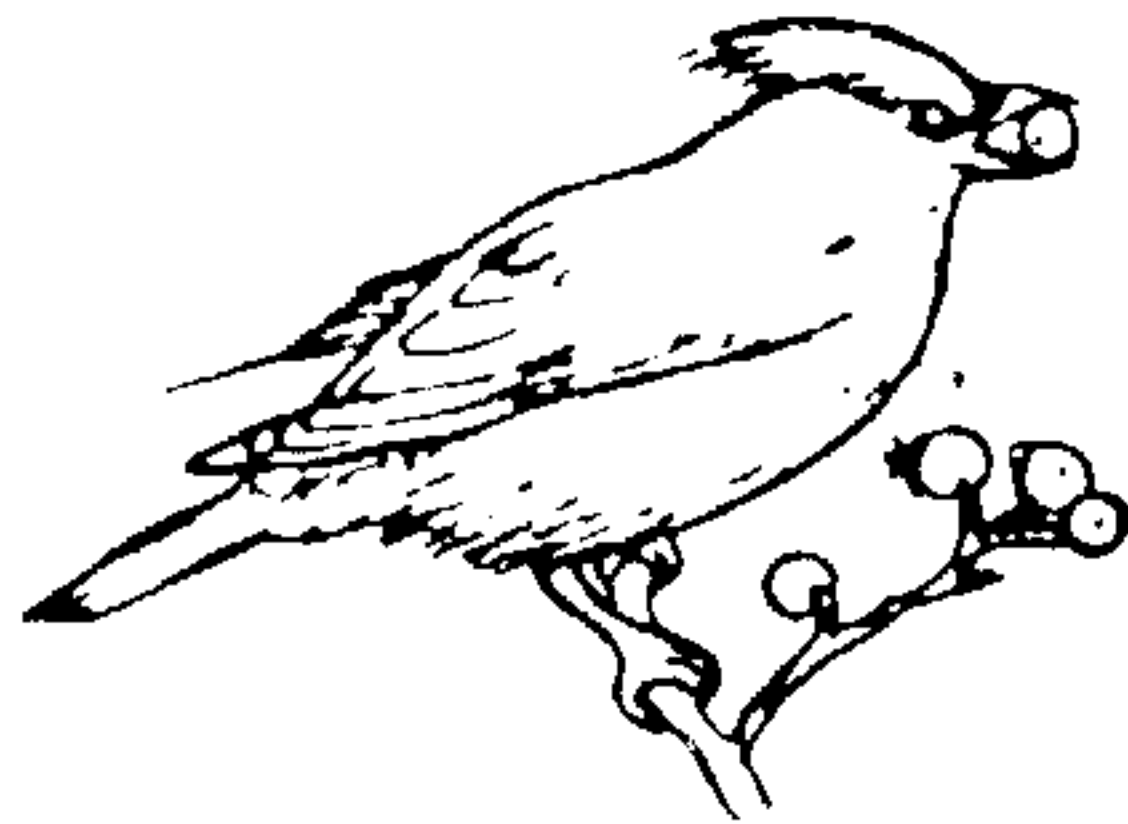
Table of content

Environment Or Habitat

at these pictures. See how plants depend on humans animals.

should plant more trees and take care of them. Humans and animals ərse the plant seeds so that more plants grow. Human and animal waste e good fertilizer for plants.

k about it.

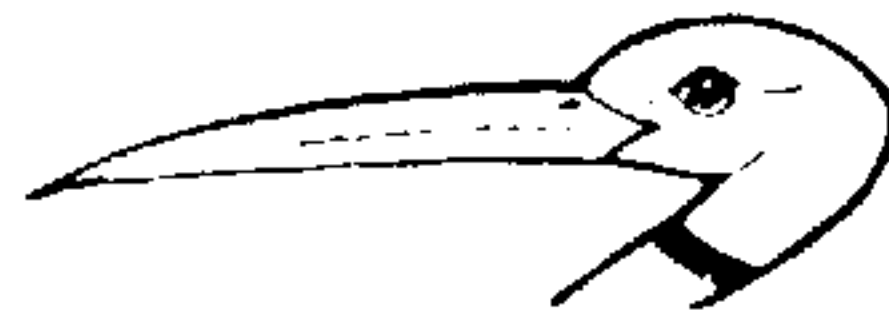
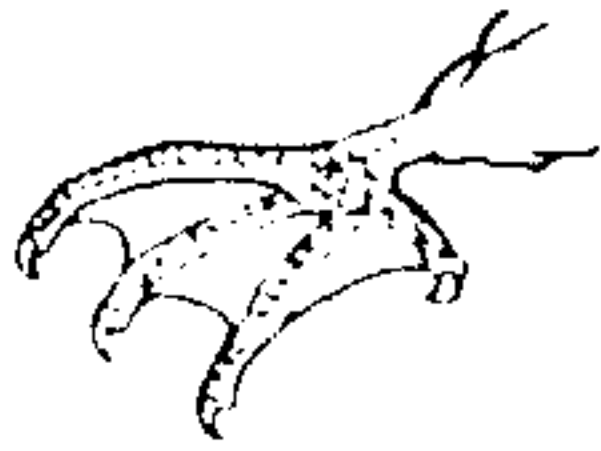
.nimals did not get enough food from plants, they would die. In turn we uld not get enough milk and meat. If we do not take care of plants, we will not ve vegetables and fruits. All living things depend on each other. They are ·dependent.

·ironment or Habitat

als and plants are suited to their conditions. They have special acteristics which suit their habitat. itat means living conditions or ronment.

: at the camel, for example. It is a desert animal. ı walk on sand because of its flat feet. Since it is difficult to find food in the ırt, it stores food in its hump. It can then go without food for days. When it əs across trees, it uses its long neck to reach the higher branches.

·r animals have different features which help them survive in different ats.

ook at these animal parts. How do these parts help animals to survive in different habitats?

nall pieces of skin in the claws of some animals (geese, for example)
lp them swim. Fish have fins which help them swim. Feathers
p birds fly and keep them warm. Birds use their beaks to peck
food.

hy do you think monkeys have such long tails?
ey use them to jump from one tree to another!

hy do you think desert plants have deep roots?
hy do they have thorns instead of leaves?

esert plants have deep roots because food and water is scarce.
e roots have to grow deeper underground in order to get more food
water. Thorns save desert plants from animals who would eat them.

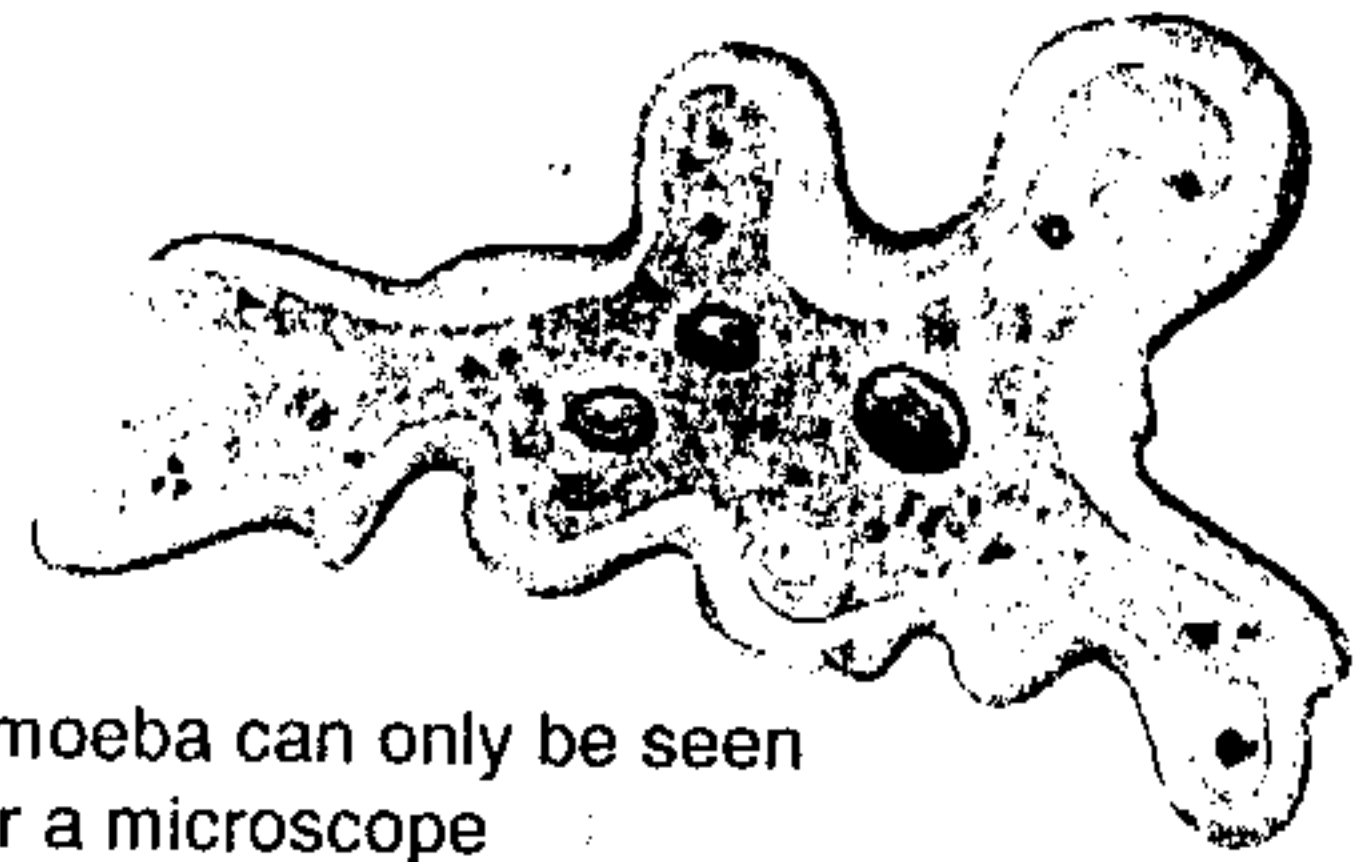
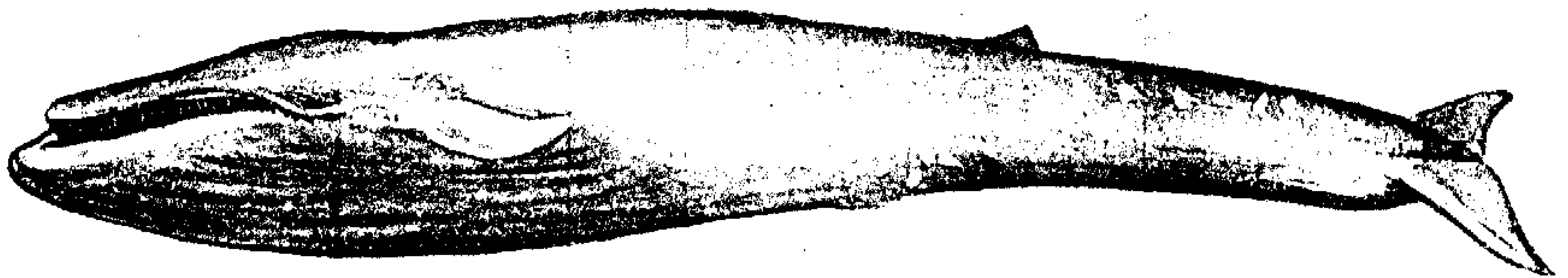
you know why the lotus has a hollow trunk.
de leaves and short roots?

e hollow trunk and wide leaves help the lotus stay
oat on the water. Since its roots do not have to stretch
for food and water, they are short.

ny do creepers have thick, rope-like vines?

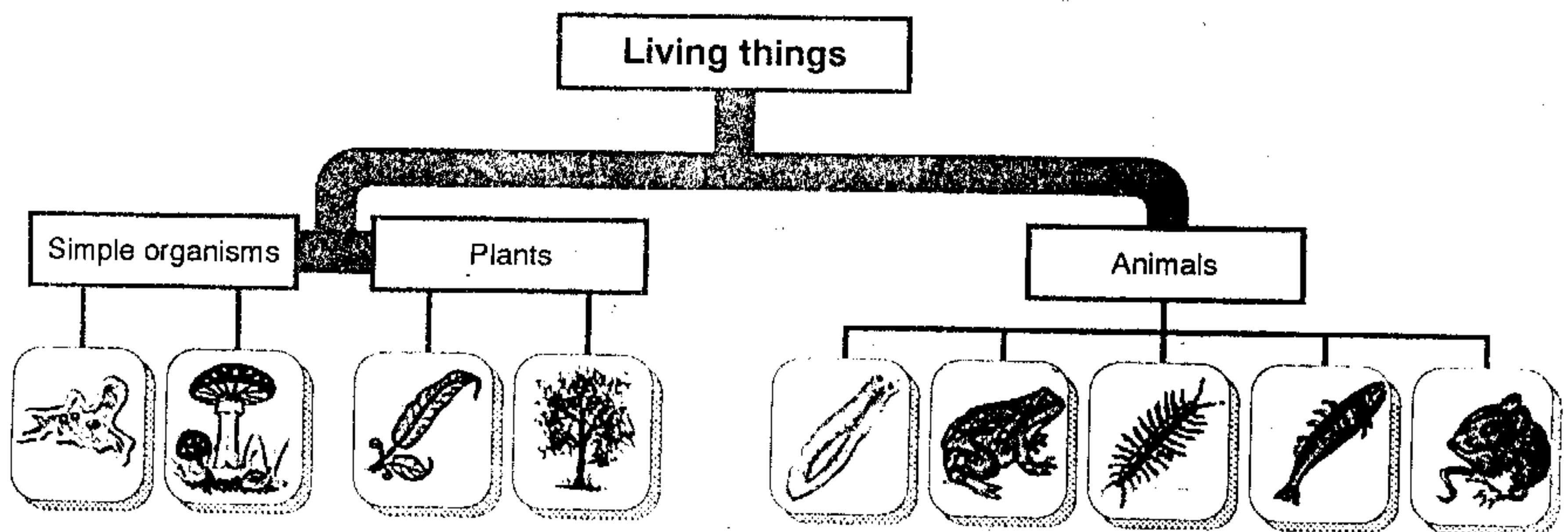
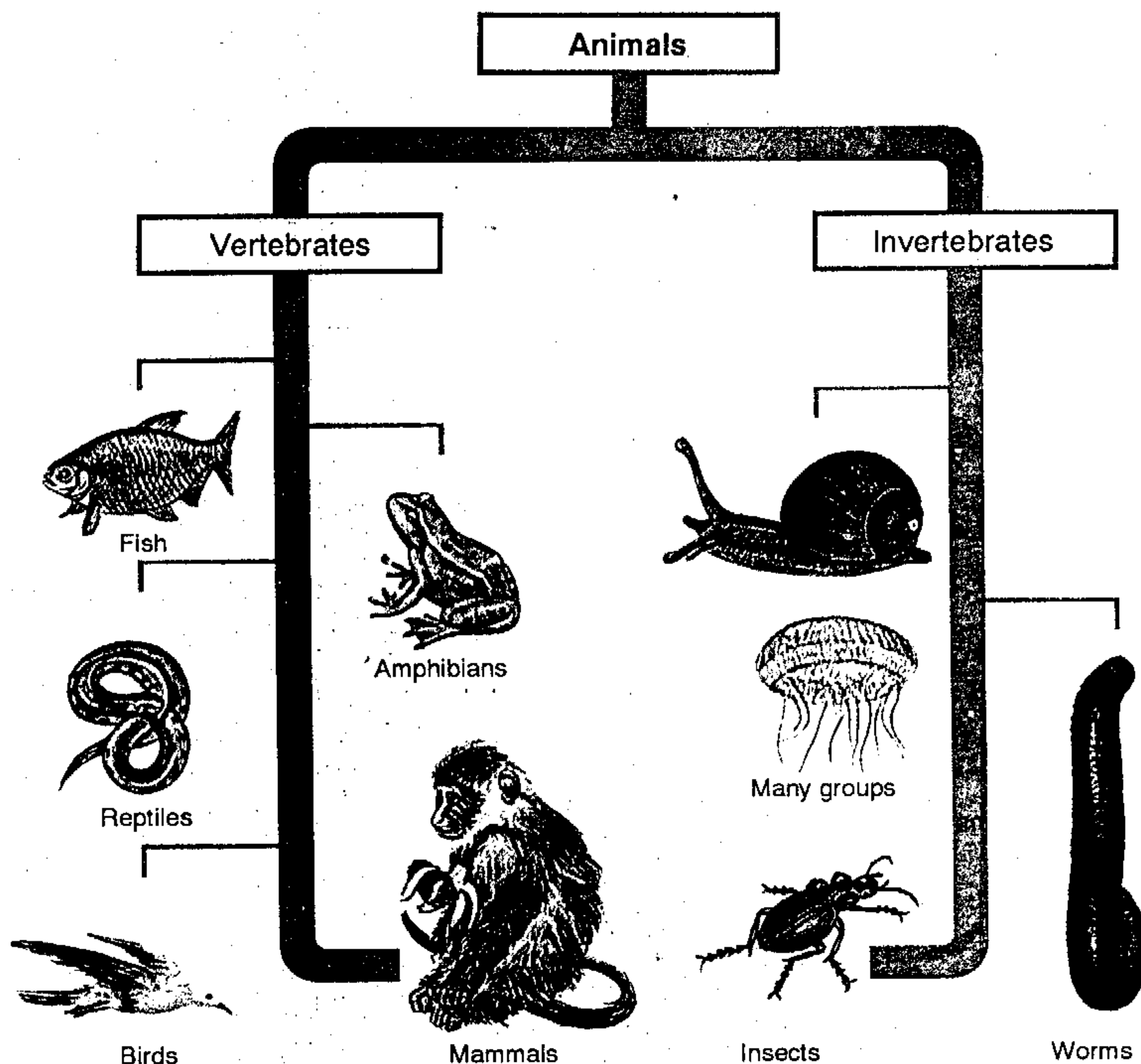
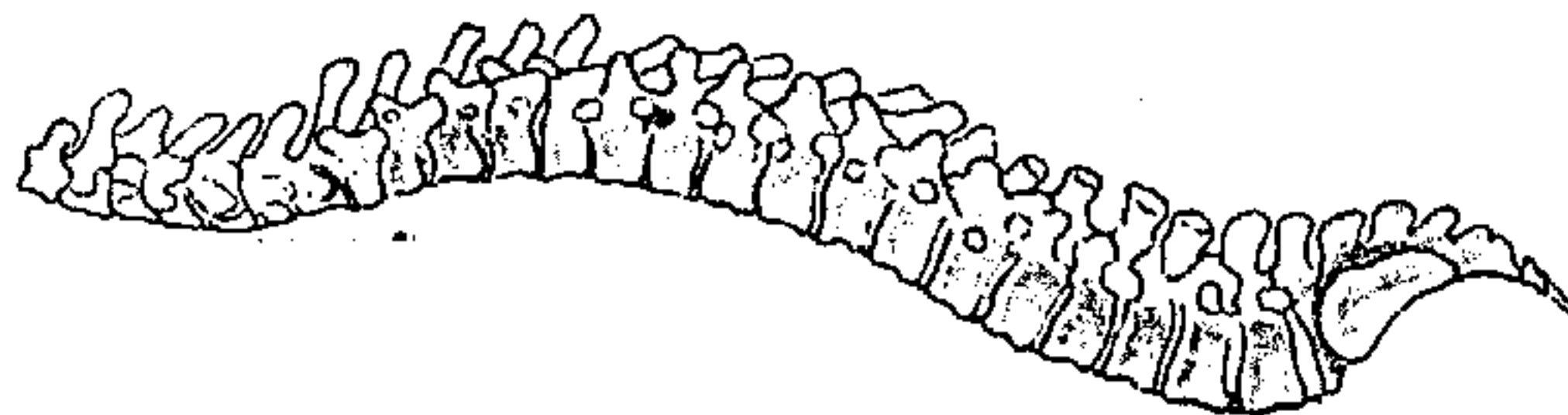
ese vines help them climb up trees or other
pports or spread out on the ground.

THE ANIMAL KINGDOM

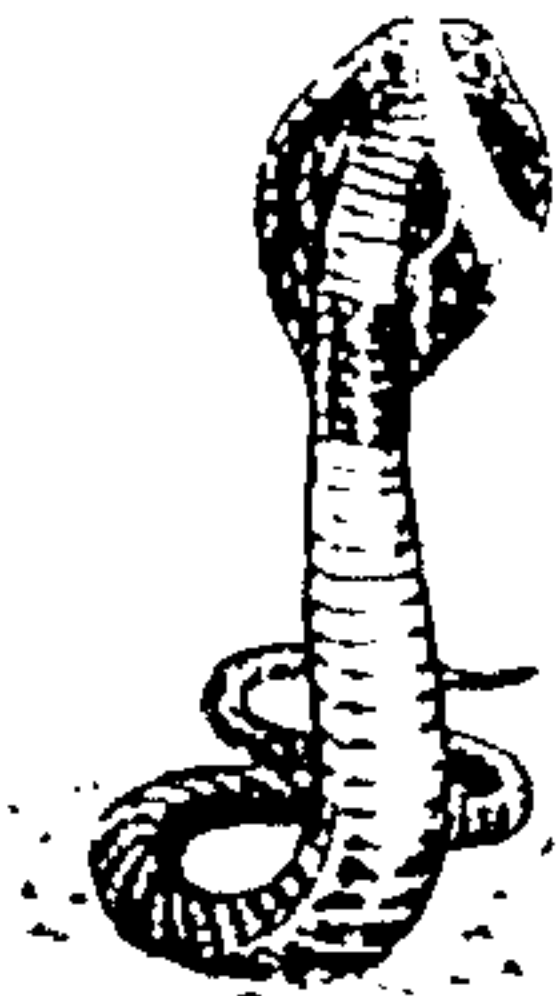
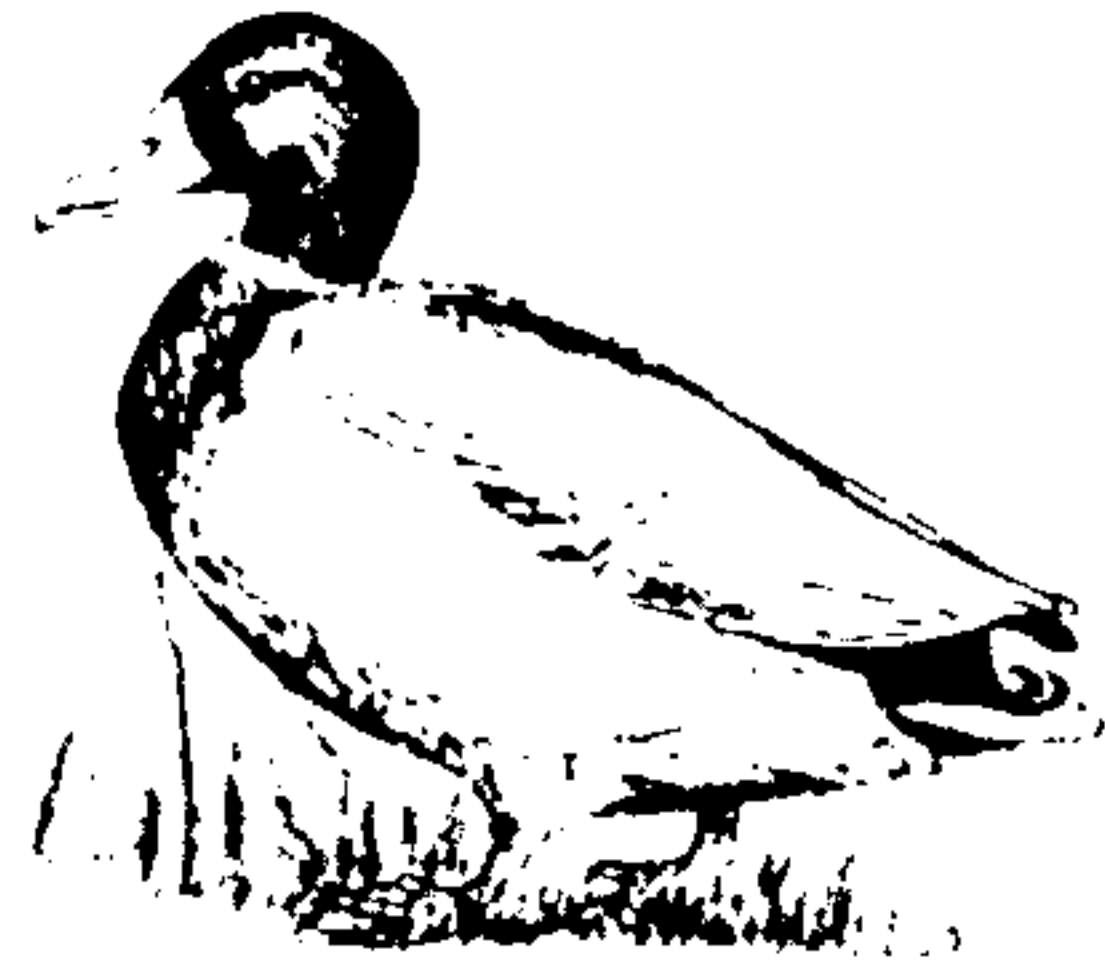
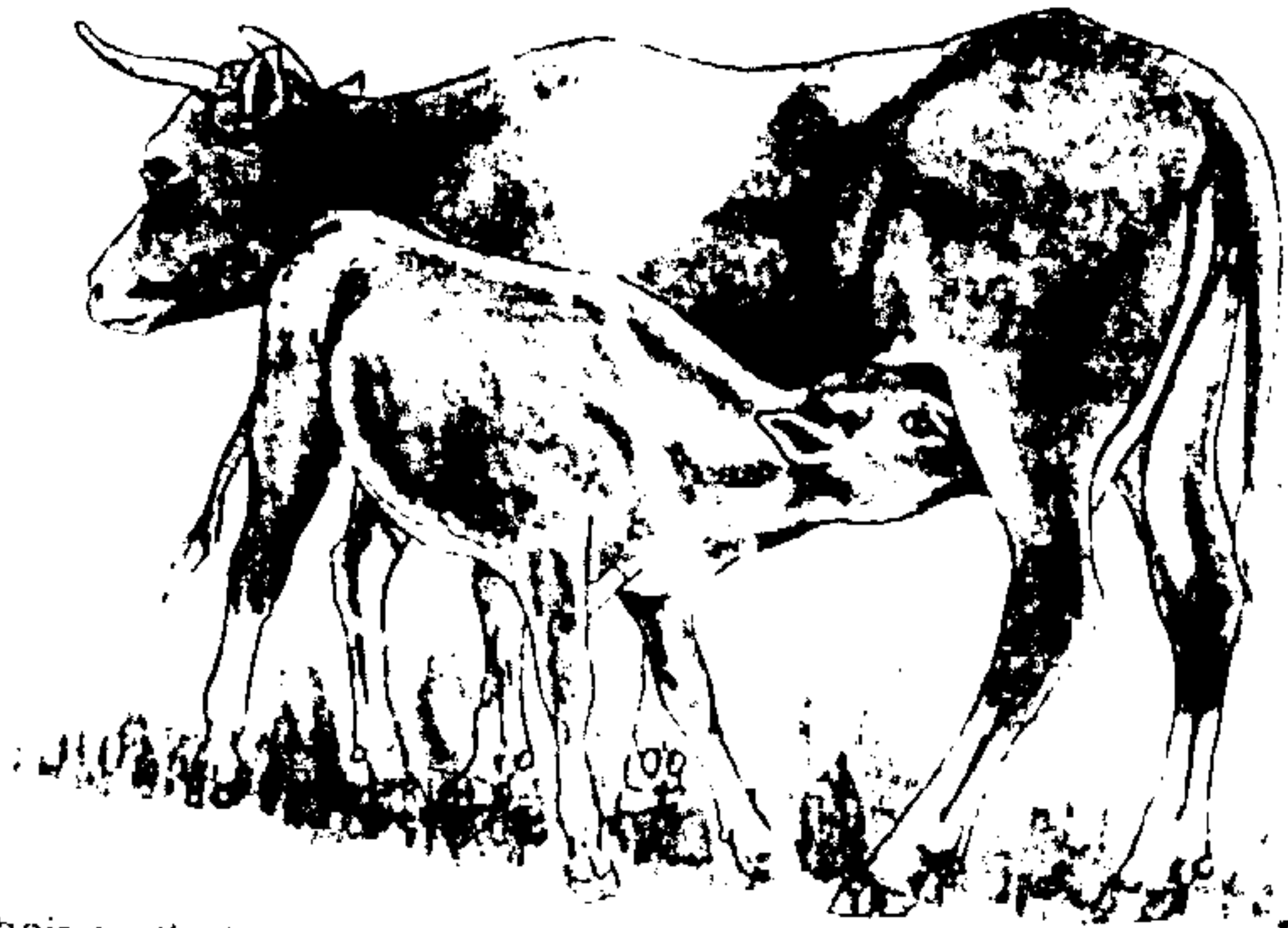
All the creatures on earth form what we call the **animal kingdom**. The animal kingdom includes hundreds of thousands of different creatures. Some are **microscopic** – so small that they can only be seen under a microscope. Others are real giants, such as the enormous blue whale.

An amoeba can only be seen under a microscope

The blue whale. The world's largest animal, 35 metres long and weighing 120 tonnes

You have done some grouping exercises before. As you learn more about living creatures you will find that scientists sort them into many different groups. This makes our study of living creatures much easier.

All living things can be sorted into three huge groups.

In this unit we are going to look more closely at animals.

Animals can be sorted into two very large groups: those without backbones (**Invertebrates**) and those with backbones (**Vertebrates**).

Vertebrates are sorted into five smaller groups. They are:

Fish: They have scales, fins, and gills, and live in water.

Amphibians. They have four limbs and live in water and on land.

Reptiles: They have skins of hard, dry scales. They lay eggs.

Birds. They have feathers and wings, but not all can fly.

Mammals: They have hair on their bodies. Females feed their young on milk.

As you can see from the groups above, thousands of animals can fit into each group. These main groups are made up of many smaller groups called sub-groups.

Rudd is a fresh water fish

Sea trout is a salt water fish

For example, we can have two groups of fish; those which live in fresh water and those which live in salt water. The bird group can form sub-groups which are made up of birds which scavenge or hunt, and those which eat vegetable matter.

Hunter

Seed eater

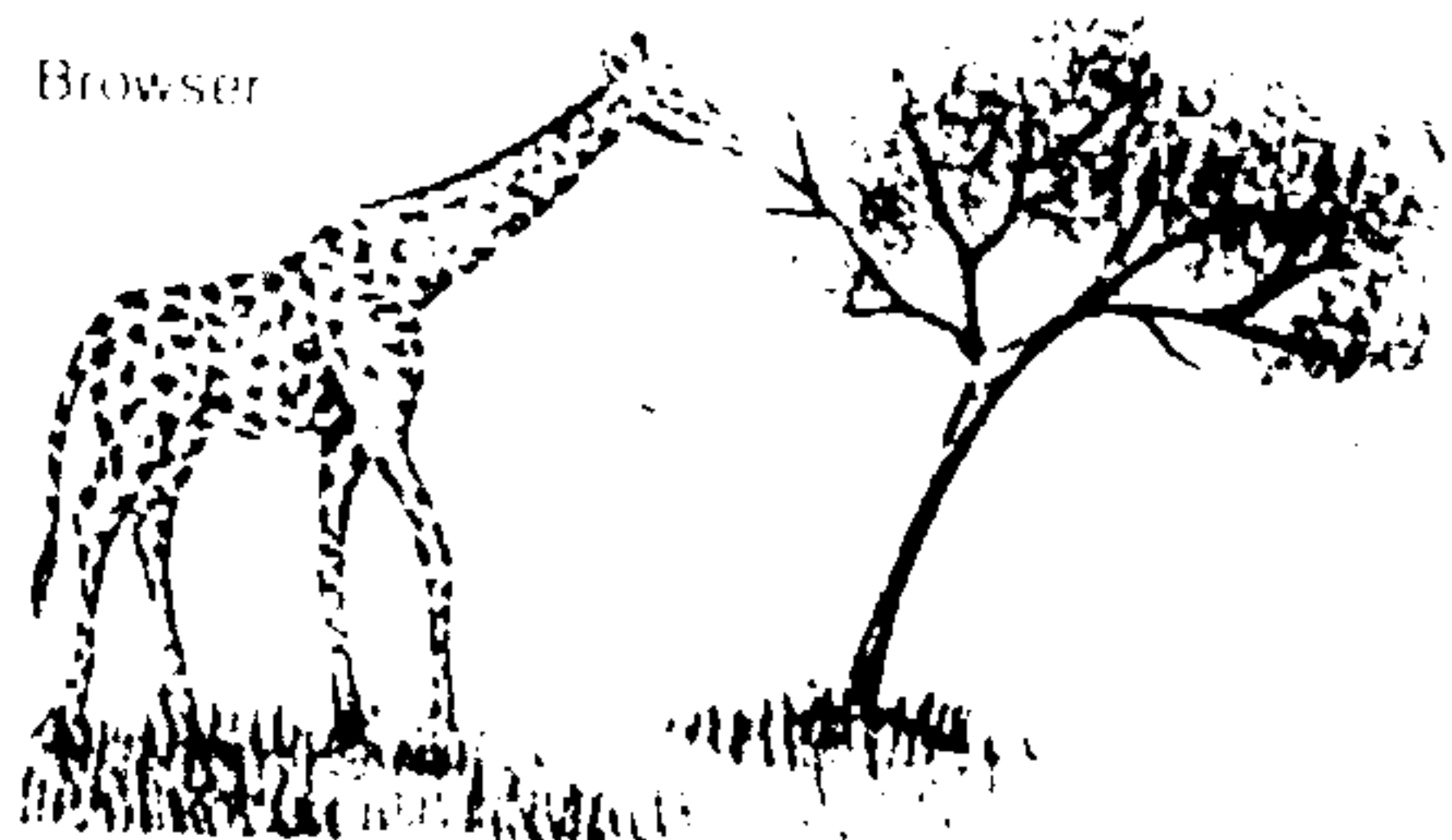
If we look at the feeding habits of mammals we can make three groups: herbivores, carnivores and omnivores. Can you remember what these words mean?

Carnivore

Omnivore

Herbivore

We can sort even further. For example take the herbivores. They can be divided into **grazers** which eat mainly grass and vegetation on the ground, and **browsers** which eat twigs, leaves and fruit. Can you think of some animals which fit into these two groups?

Grazer

Browser

If we look at where animals spend most of their time, there is another way of dividing the animal kingdom into groups.

> **aerial**: of the sky
> **arboreal**: of the trees
> **terrestrial**: of the ground
> **aquatic**: of the water

So you see, there are many ways of sorting animals into groups. You know quite a lot about some animals in some of the groups. In the following units you will learn about mammals, reptiles and fish.

Questions

A *You can find the answers to these questions in the text:*

1 What three groups can all living things be sorted into?

2 How would a scientist describe the following?
  - **a** a bird
  - **b** a fish
  - **c** an amphibian

3 What do these words mean?
  - **a** arboreal
  - **b** terrestrial
  - **c** vertebrate
  - **d** browser

4 Are insects vertebrates or invertebrates?

5 What is the biggest living animal? How big is it?

LIGHT

Transparent (شفاف), translucent (نیم شفاف) and opaque (غیر شفاف) objects

You have studied in your previous (سابقہ، گزشتہ) class that light travels (سفر کرنا) in a straight (سیدھی) line. You must have seen that light passes through some objects while it cannot pass through others.

On the basis (بنیاد) of passage (گزرنے) of light, objects can divide (تقسیم کرنا) into three categories:

(i) Transparent objects
(ii) Translucent objects
(iii) Opaque objects

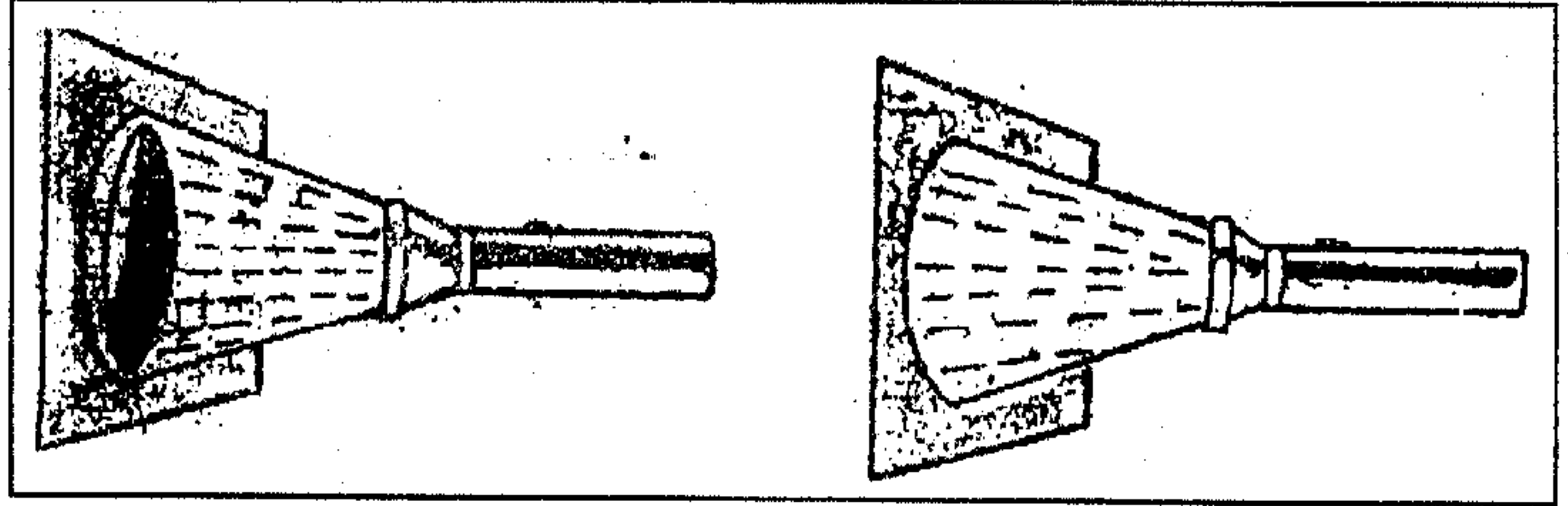
Objects which allow (جانے دینا) all the light or a major (بڑے) portion (حصے) of light to pass through them are called "transparent objects". Examples are those of air water and glass etc. Through which you can see. If there is a table on the other side of a glass sheet then you can see the table.

There are some objects which allow some light to pass through and absorb (جذب کرنا) some of it are known as "Translucent objects". The best example .is that of a "frosted (دھندلا، کہر آلود، بخارات بنے ہوئے) glass". Frosted glass is normally (عام طور پر) used in the doors and windows of bathrooms. So that the light can enter (داخل ہونا) the room but no body (کوئی بھی) can see through it.

There are some objects, which either (یا) absorb all the light or reflect (منعکس کرنا) it completely (مکمل طور پر). Thus (اس طرح) no light passes through them. Such objects are known as opaque objects. The examples of opaque objects are brick. Stones, book, plate etc. things are not visible (نظر آنے کے قابل) across (پار) the opaque objects. Thin (پتلا، باریک) sheets (چادر) of opaque objects are translucent. A book is an opaque object but a paper is a translucent object.

Different objects have different colours. Why?

You know that white light is composed (بنا ہوا، ترکیب شدہ) of many colours. You also know that light passes through, is absorbed or returns back (مڑنا) when it strikes different

objects. Now let us study why different objects have different colours.

Study the colour of light from a torch. Cover the torch with a piece of thin red paper. What is the colour of light coming out of the torch? The colour of light is red because only red rays can pass through the paper where as the other rays are absorbed by it.

What will be the colour of paper if red light falls on a white one?

Why does the paper appear (نظر آنا) to be red? The light which is striking (ٹکرانا) the paper is red therefore, the paper reflects (منعکس کرنا،لوٹانا) only (صرف) red light. This red light when reaches our eyes. The paper appears to be red. Repeat (دہرانا) the experiment using blue and green papers.

You will see that the colour of different objects is due to the type of light rays that are reflected back. A rose is red because when white light falls on it, it absorbs all the other rays and reflects only red rays. A blue cloth absorbs all the other rays and reflects only blue rays. Can you tell why a white paper is white? Or a black object is black?

A white paper does not absorb any colour and reflects all the colours. A black object absorbs all the colours and does not reflect any colour.

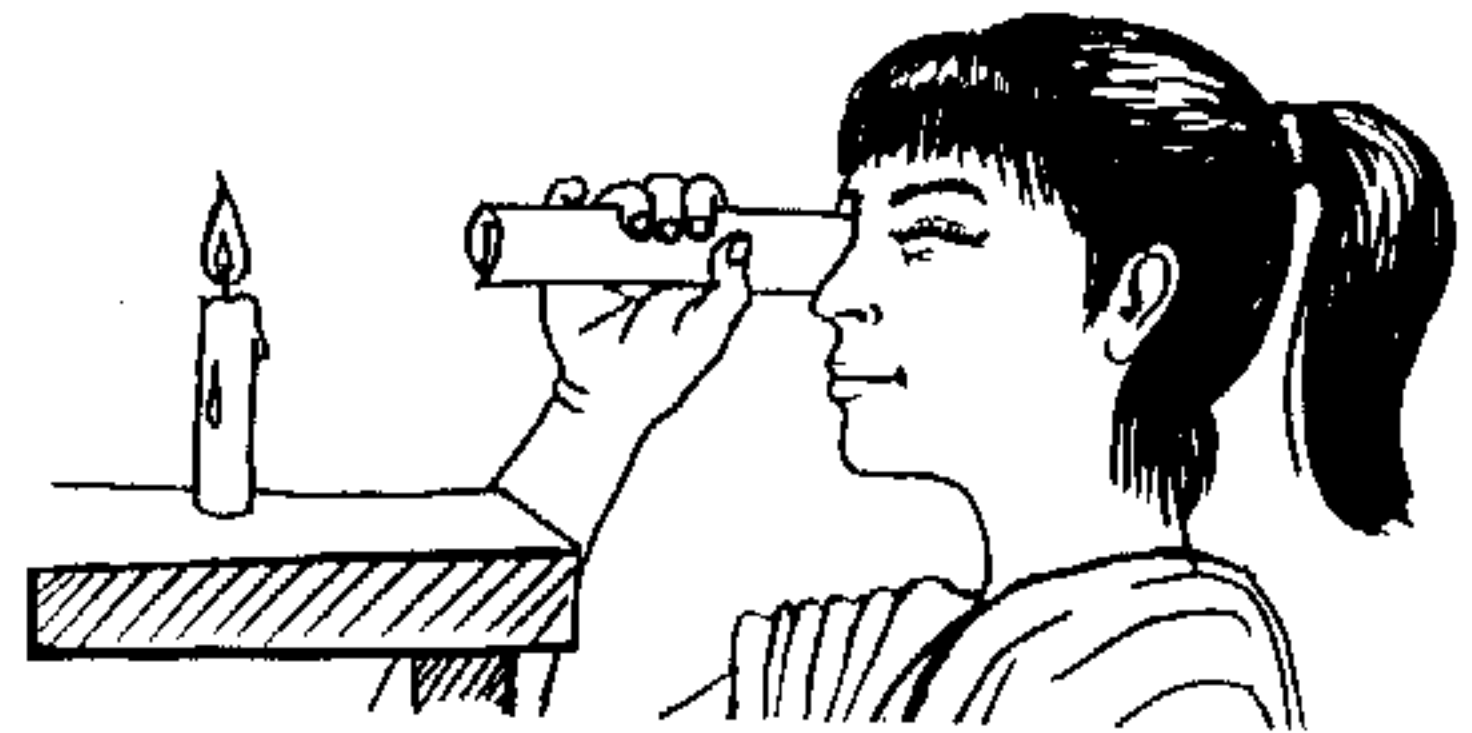
QUESTIONS

1. What do you know about transparent, translucent and opaque objects? Explain by giving examples.
2. Transparent objects do not have any shadows. Why?
3. Opaque objects do have shadows, why?
4. Why do different things have different colours?

LIGHT AND COLOUR

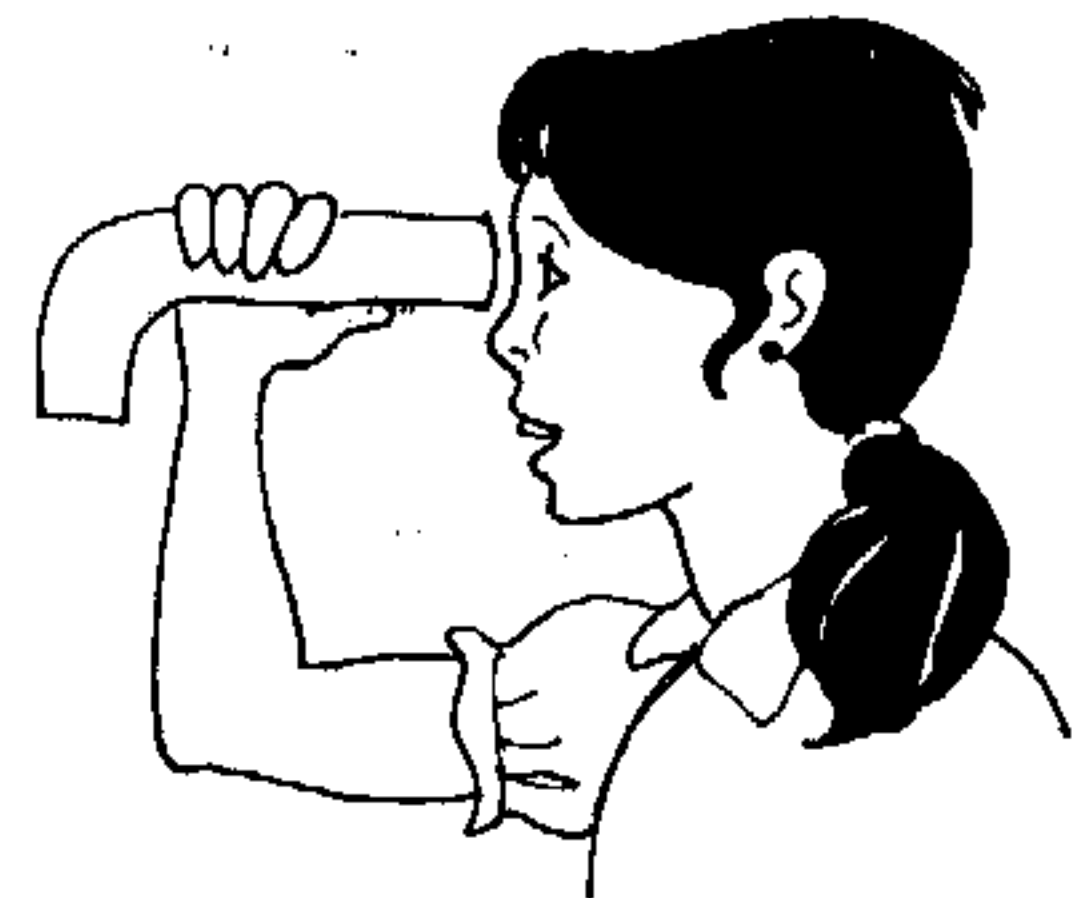
How Light Travels

Light is a form of energy. We need light to see.

Light travels in straight lines.

Activity 1

Equipment: A candle, a piece of paper.

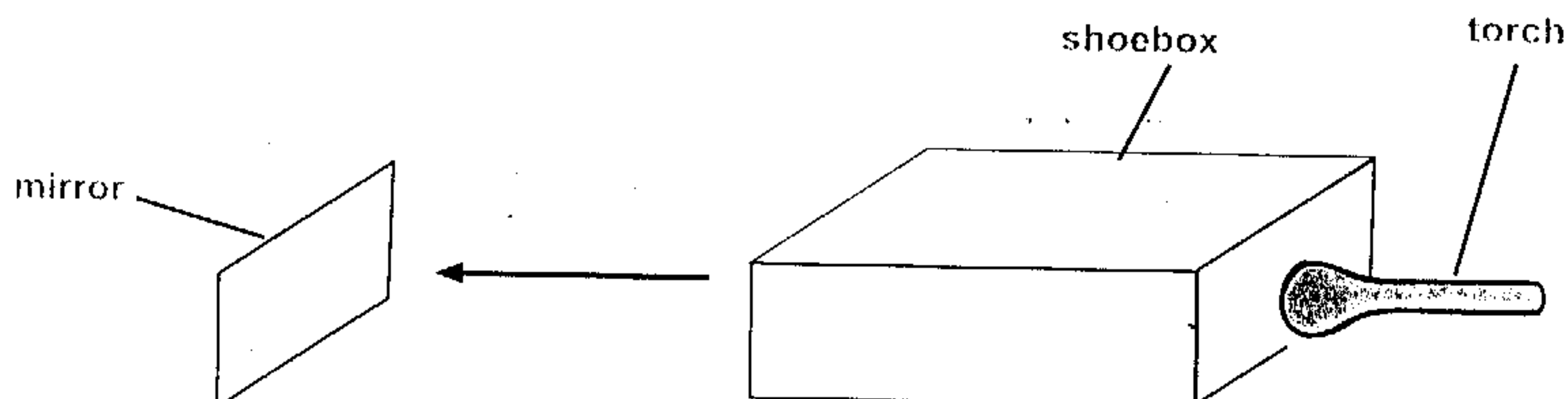
Method: Light the candle. Roll the piece of paper into a cylinder. Look through this paper cylinder at the candle flame. Now bend your paper cylinder slightly and try to look at the flame again.

Could you see the candle flame clearly the first time? What happened when you bent your paper cylinder? Could you still see the flame as clearly as you saw it the first time? Why?

You can see the candle flame through the straight cylinder because light travels in straight lines. When the cylinder is bent, the light also bends away and you cannot see the flame clearly.

The Reflection of Light

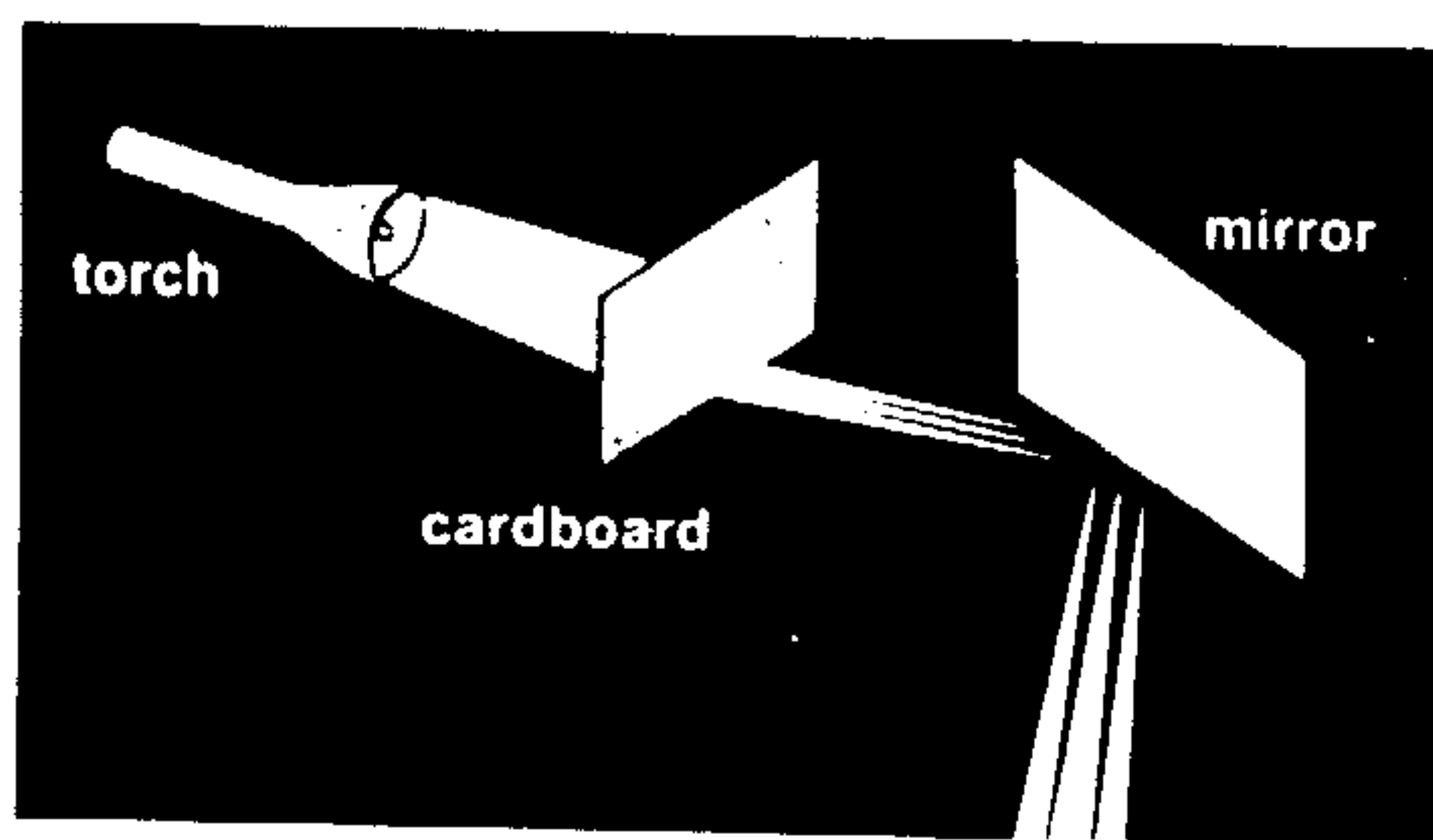
If you throw a ball against the wall, it bounces back to you. Similarly, when light rays travelling in straight lines hit a surface, they bounce off the surface.

Activity 1

Equipment: A small mirror, a shoebox, a blackboard duster.

Method: Fit the torch in the shoebox, as shown. Make a slit on the opposite end of the box. Place the mirror upright on a table. Turn on the torch and direct the beam towards the mirror. Now strike the duster in the path of the beam. Observe what happens.

How many beams of light do you see? Are they straight? Draw a diagram of what you see. Do you know the name of the process you have just observed? It is called reflection.

Equipment: A small mirror, a torch, a piece of black cardboard with narrow slits cut along one side, as shown, a darkened room.

Method: Darken the room. Set up the equipment as shown. Observe carefully what happens to the light rays when they reach the mirror. Briefly describe what you see.

Summary

Light travels in a straight line. When it hits a surface, it bounces back. This process is called reflection. When light reflects, it changes its direction but still travels in a straight line.

Sunlight enables us to see all around us. Does it look white to you? It is actually made up of seven colours. Together, these colours are called the spectrum. You can split sunlight into seven colours using a special technique.

Equipment: A prism.

Method: You can only do this activity on a sunny day. Go out into the school playground. One student should hold the prism and stand with his/her back toward the Sun. The prism should be held in a way that the Sun's rays hit it on one side. The student should keep moving the prism until it catches the Sun's rays properly. Once the sm is set at the right angle, you can see a pectrum of coloured lights on the ground below . Count the colours and write their names in the :der that you see them. After returning to the classroom, draw a diagram of the spectrum you have just seen.

ave you seen this spectrum of colours before? Where? What does the prism do to white sunlight?

ow you know that white light can be split up into seven colours. That means that these seven olours, when put together, make white light.

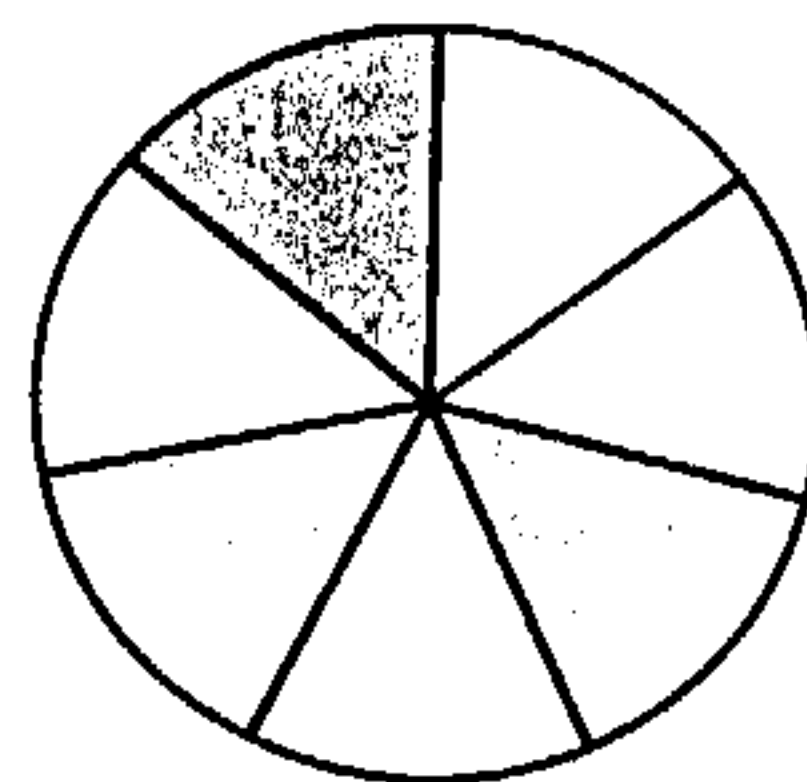
Activity 2

Equipment: White card cut in a circular shape, a compass, colouring pencils in the seven colours of the spectrum.

Method: Divide your card into seven portions using a compass. Colour each portion with a different colour. Make a small hole in the centre of the card. Place the card flat on your desk. Place the tip of the compass through the hole. Spin the card as fast as you can.

Alternatively, after colouring the card, make two holes in it. Pass some thread through the holes. Tie the loose ends together, as shown. Twist the thread quite tightly on either side. Now release the thread and let the card spin quickly.

What does the card look like when it spins at its maximum speed?

When the card was spinning very fast, it was not possible for you to see the colours individually. You saw the combined effect, which was white. The colours of the spectrum together make up white light.

Summary

Sunlight is made up of the spectrum of seven colours – red, orange, yellow, green, blue, indigo and violet. You see the same colours in a rainbow. A rainbow appears in the sky when sunlight passes through rain drops and splits into seven colours.

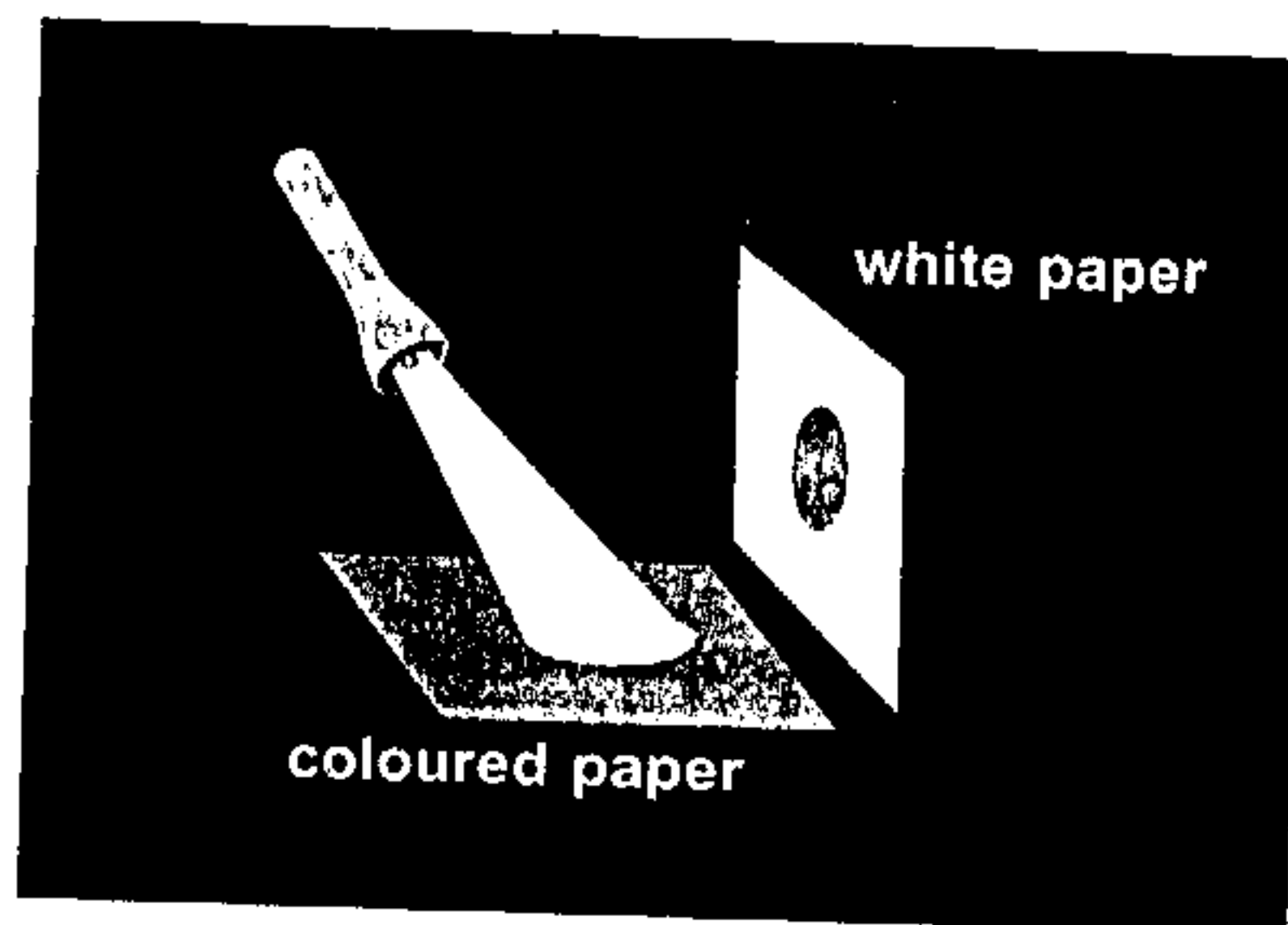
Colours

We see thousands of colours all around us. Leaves are green. Roses are red. The sky is blue. We have clothes of various colours. Why do things have different colours?

Activity 1

Equipment: A torch, a sheet of white paper, red, blue and green sheets of cellophane paper, a darkened room.

Method: Spread the red cellophane sheet on your desk. Hold the white sheet next to the red sheet, as shown. Turn on the torch and point it onto the red sheet, so that the light reflecting from the red sheet hits the white paper. What colour light does the torch give off? What colour is the light that is reflected onto the white paper?

Repeat the activity using the blue and green sheets of cellophane. What colour is reflected onto the white paper when you use a blue sheet? What colour is reflected onto the white paper when you use a green sheet? What can you conclude from this activity?

Each sheet of coloured paper reflected its own colour. That means that when the white light from the torch hit the coloured sheet, all the colours of the spectrum were absorbed by the sheet except its own colour. The colour of the sheet was reflected.

Summary

A coloured object appears coloured because it absorbs all of the colours of white light except its own. The colour that is reflected appears to be the colour of the object.

Sound

The world is full of sounds. Some sounds are nice. Some sounds are not nice. Can you think of some examples?

What is Sound?

Sound is a form of energy.

Do you know how a sound is produced? Vibrations produce sound. Slow vibrations make soft sounds. Fast vibrations make loud sounds.

Activity 1

Stretch a rubber band between your thumb and forefinger. Pull the stretched band with another finger. Do you hear anything?

Activity 2

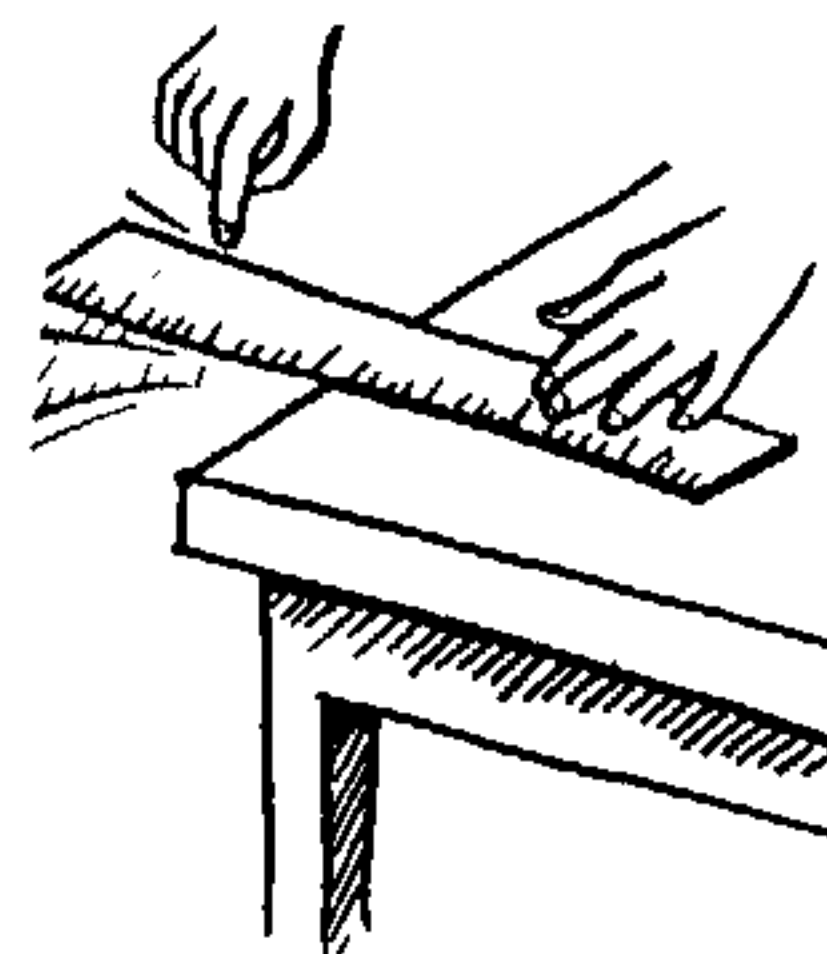
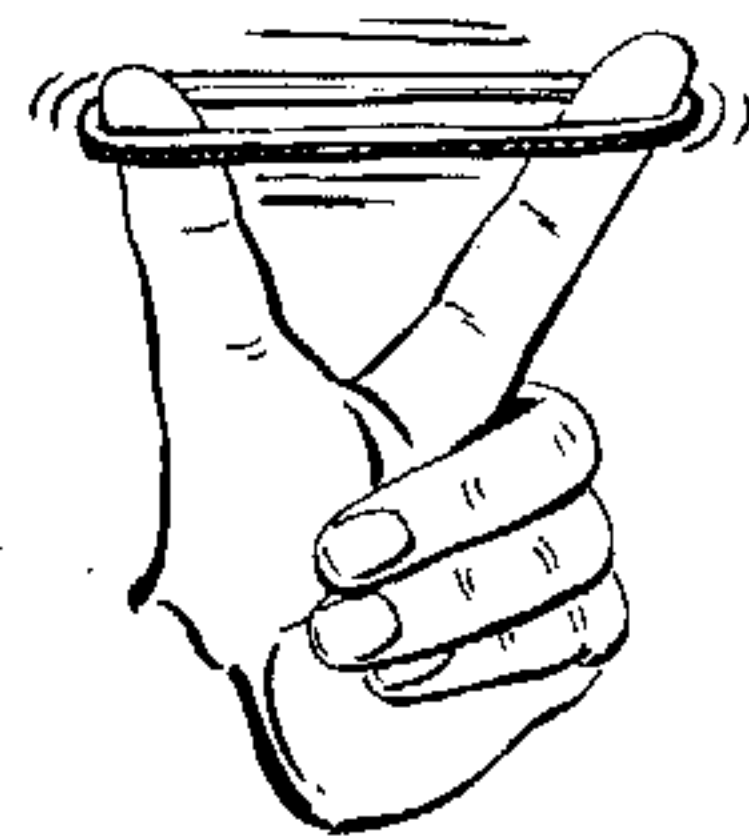
Equipment: A ruler or metal or plastic strip.

Method: Hold down your ruler tightly on the edge of your desk. Pull it down with your hand and then suddenly release it. What do you see? What do you hear? Now grab the ruler. What happens to the sound?

How do we make sounds when we speak?

Do you know where our vocal cords are?

Activity 3

Hold your throat tightly a few centimetres below your chin. Talk. Write down what you feel.

Summary

When you pulled the stretched rubber band with your finger, it vibrated. You heard it humming. This means that the vibration of the rubber band produced sound. You also made the ruler vibrate. The vibration of the ruler produced a different sound. You can also produce a sound by clapping your hands together. Sound is a form of energy.

Note for Teachers

Give students enough time to do Activities 1, 2 and 3. Make sure that there is not much noise when students do these activities so that they can clearly hear the sound produced by the vibrations. Tell students that they are holding their vocal cords in Activity 3. Vocal cords cannot vibrate when held tightly. That is why students cannot hear what they are saying.

Sound Travels in Waves

Throw a pebble in a pond and watch the ripples spread outwards. The impact of the pebble on water results in waves. Similarly, vibrations cause sound waves in the air which travel forward. Sound waves are invisible. We cannot see them. We hear a sound when these waves strike our ears. The vibration of our vocal cords produces sound waves. The air passing through the vocal cords pushes these waves forward.

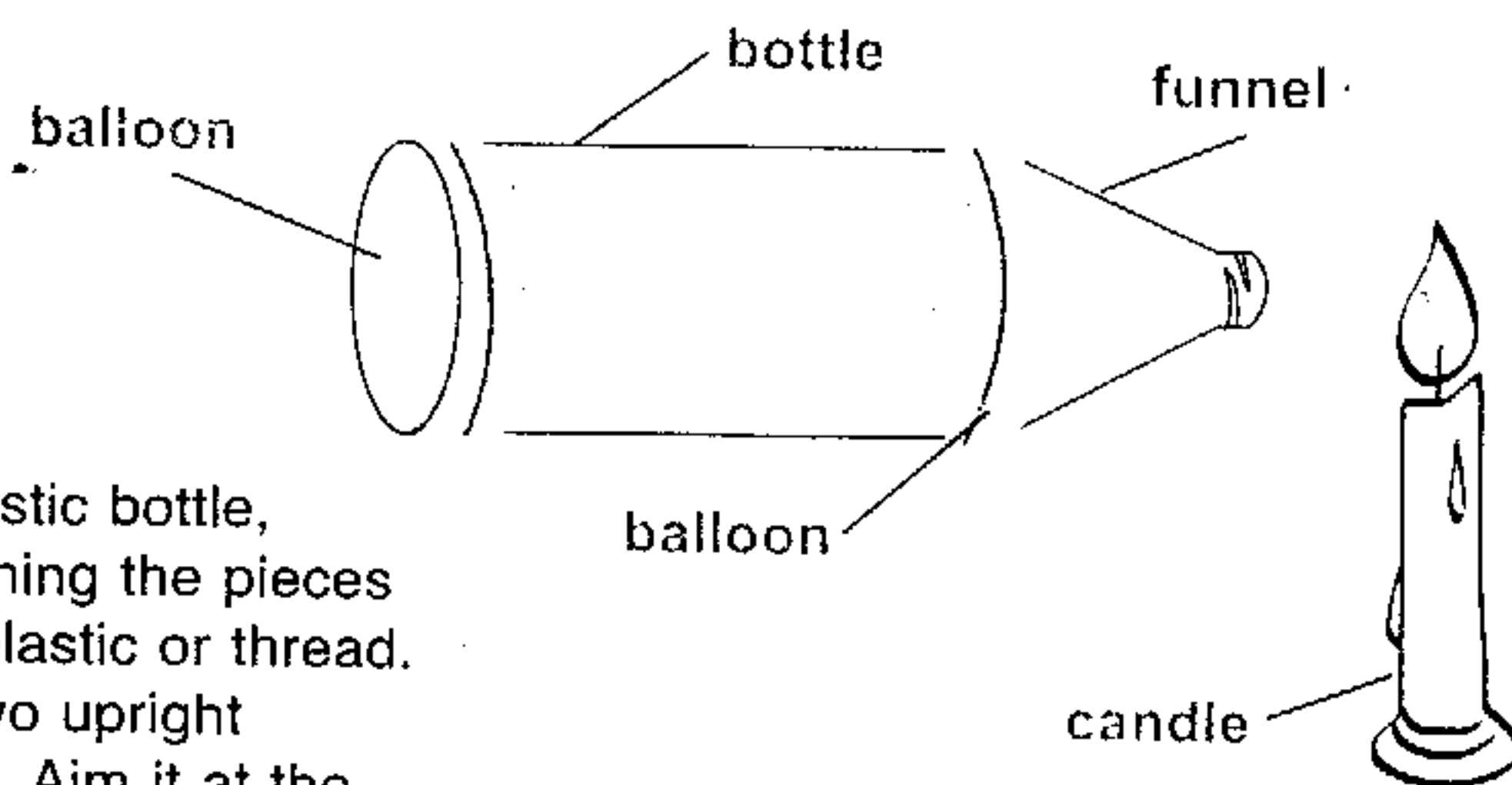
Do you know that there is no sound on the Moon? There is no air there to carry the vibrations.

The following activity will demonstrate how sound waves travel through air.

Activity 1

Make a sound cannon.

Equipment: A tin can or a large plastic bottle, a balloon cut into two pieces, a plastic funnel or the top of a plastic bottle, a thin curtain of foil cut into strips or a candle.

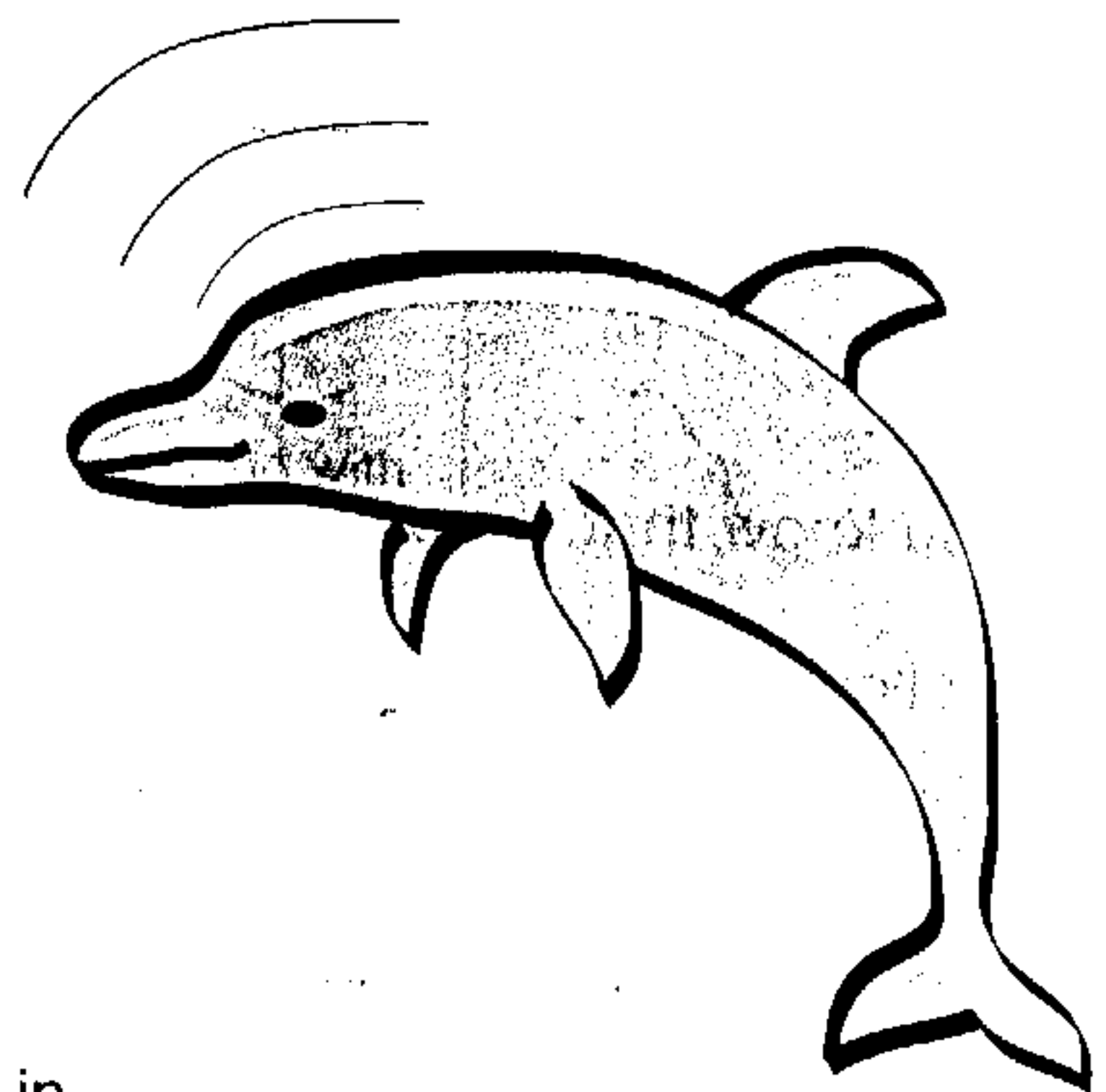
Method: Remove the base and top of the tin can or plastic bottle, turning it into a cylinder. Cover the open ends by stretching the pieces of balloon over them. Tighten these covers with some elastic or thread. Attach the funnel to one end. Fix the curtain of foil to two upright objects or light the candle. Your sound cannon is ready. Aim it at the foil curtain or the lit candle and tap the stretched balloon drum several times. What happens? Why?

Summary

The vibration of our vocal cords produces sound waves. The air passing through the vocal cords pushes these waves forward.

What is an Echo?

What happens when a ball strikes the ground?
It bounces back. Similarly, when sound waves strike a wall or any hard surface, they bounce back.
This process is called reflection. The reflecting sound is called an echo. You can hear your own echo if you shout in an empty hall or in a valley or clap your hands together in front of a wall. Try it out for yourself.

Uses of Echoes

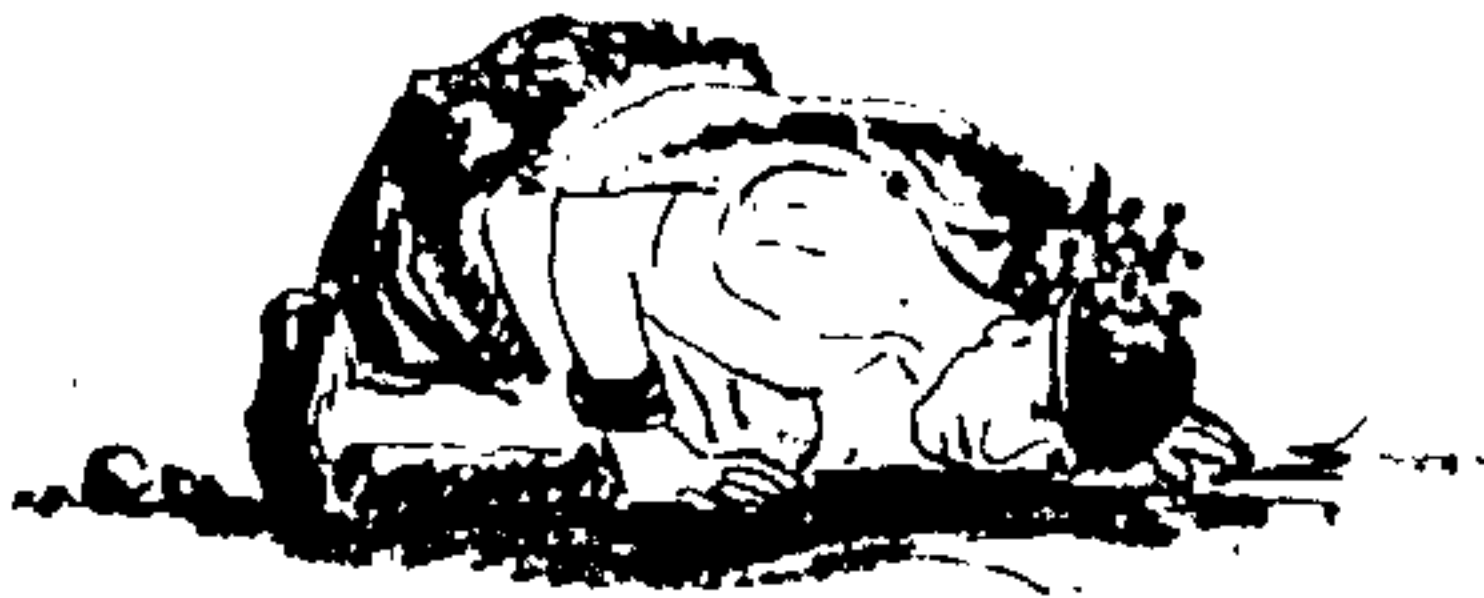
Echoes help humans and animals in various ways. Dolphins use echoes to hunt and find their way in murky sea water. They give out a special clicking sound. It strikes an object or a fish and bounces back. Listening to the echo, they know how far the desired object is.

Echoes help us find objects we cannot see. Many ships have a special system on board called sonar which emits sound waves. These waves reflect off the seabed and off of large shoals of fish. The depth of a body of water can also be measured in the same way. Fishermen use this equipment to determine where to throw their fishing nets.

Bats are flying mammals that use echoes to find their way in the dark and to hunt for insects at night.

ote for Teachers

'hen discussing echoes, do a class demonstration of a ball bouncing off the ground and off the wall.

THE EAR

Do you remember reading about sounds in Book 3? Sounds are made by vibrations. Sound waves travel through the air. They also travel through water, and solid materials. We cannot see sound waves travelling.

Sound travels faster through the ground than through the air

Your two ears are your organs of hearing Ears also help you with something else They help you to balance

How the ear works?

Let's look at the diagram of the human ear on page 16.

The **outer ear** acts like a funnel Sounds enter this funnel which is called the **ear canal**. This canal is lined with hairs It also produces wax.

Sounds reach the end of the ear canal and enter the **middle ear**. Here there is a thin skin wall called a **membrane** There are membranes in other parts of the body too.

Sound waves travel through the air

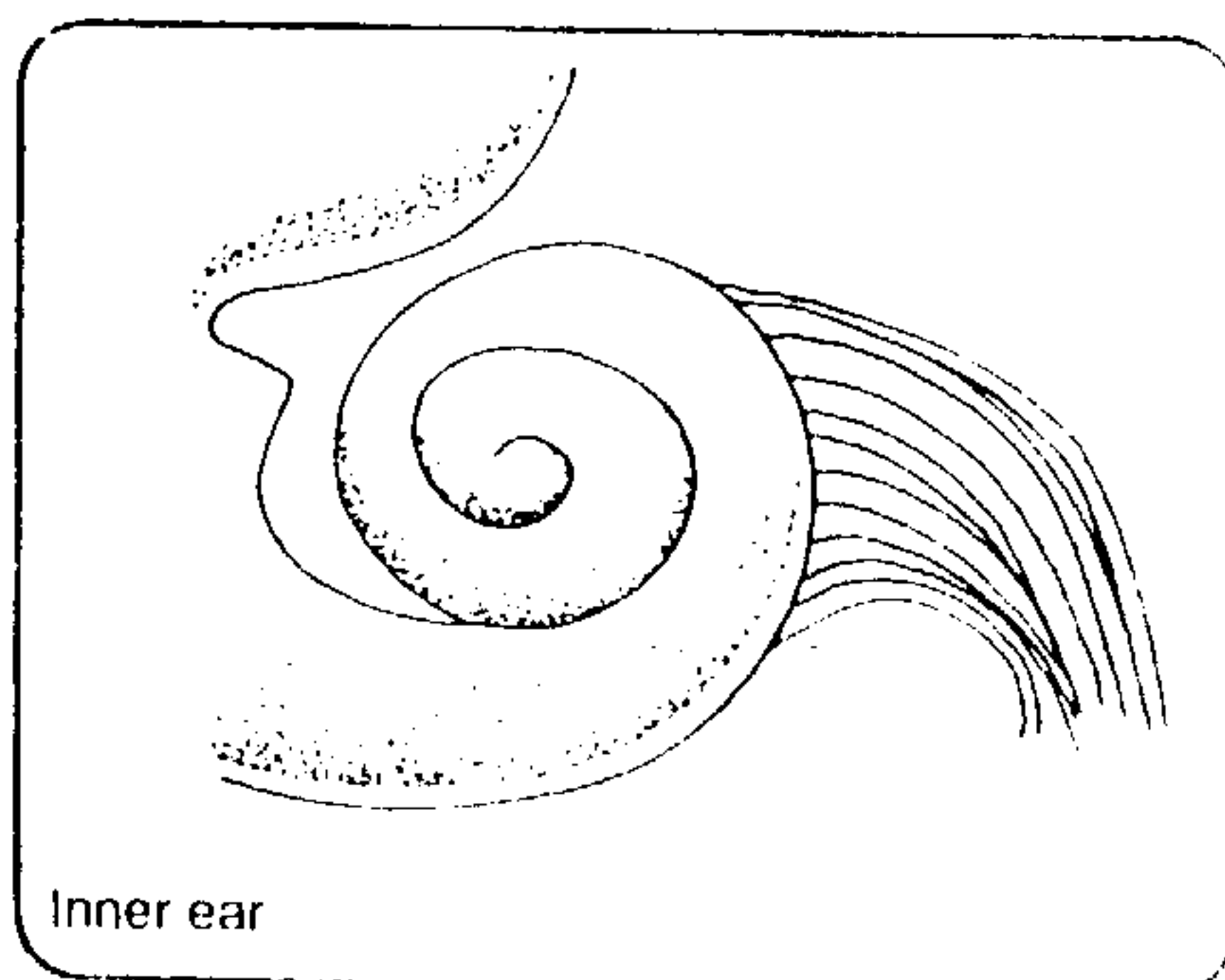
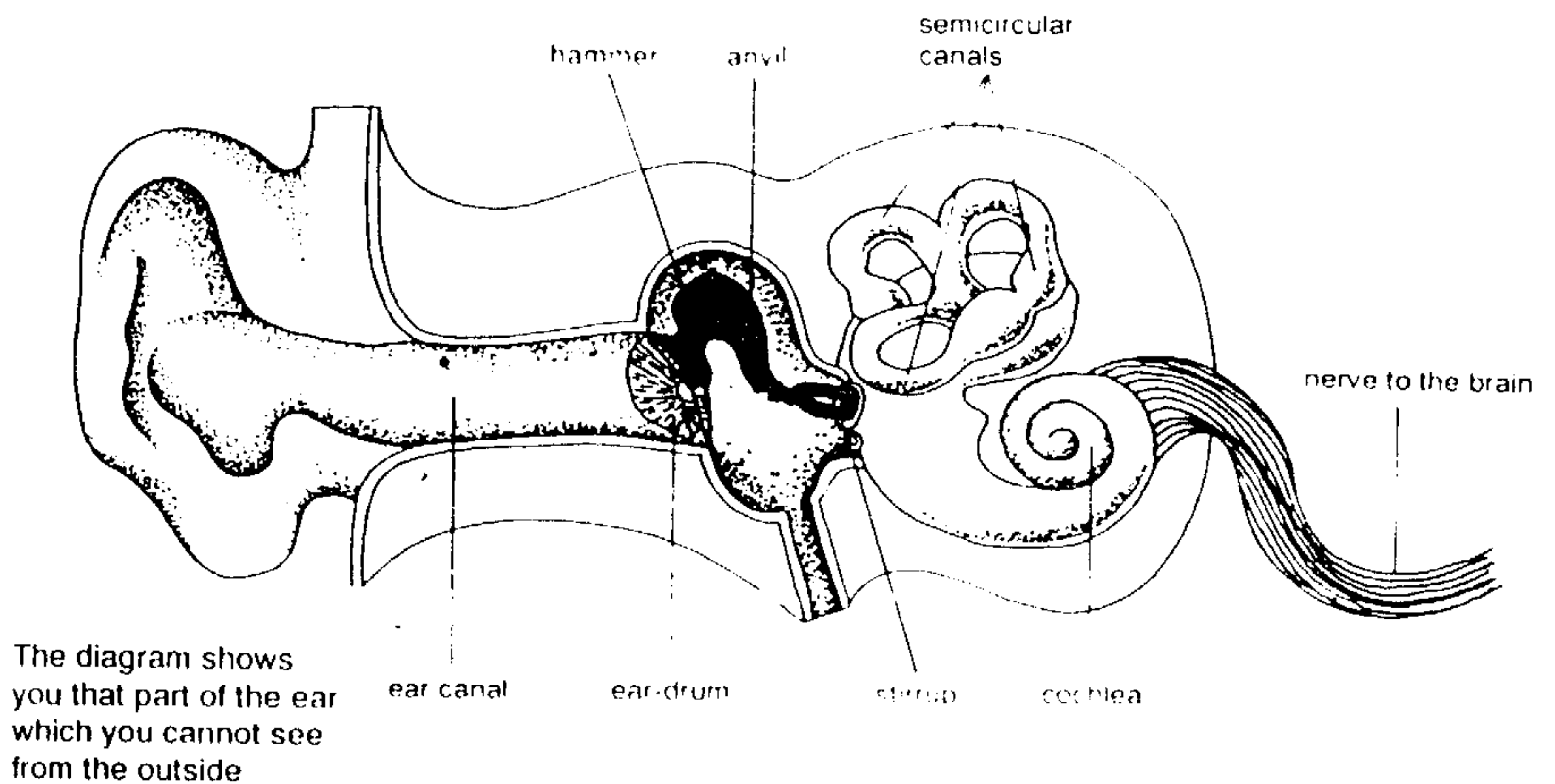
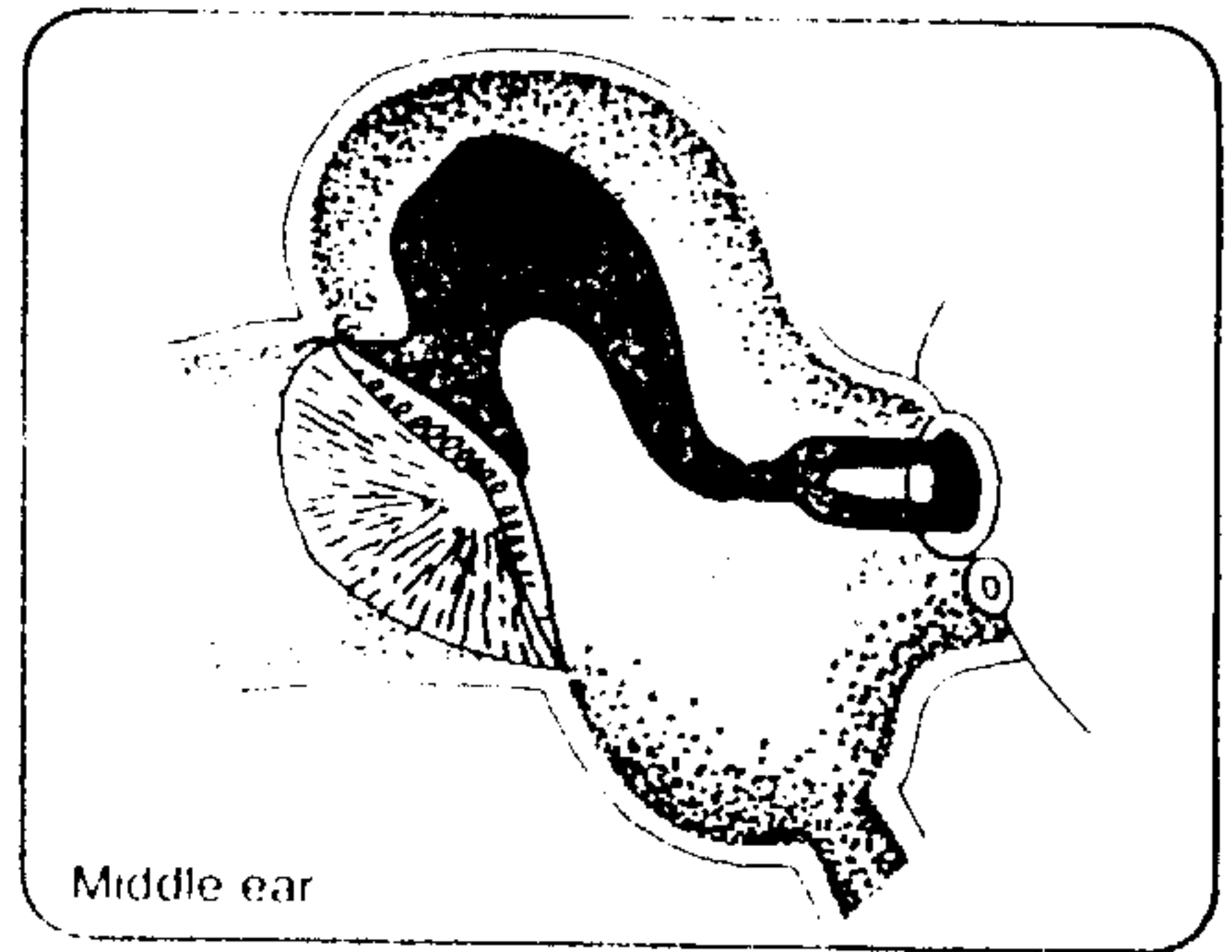
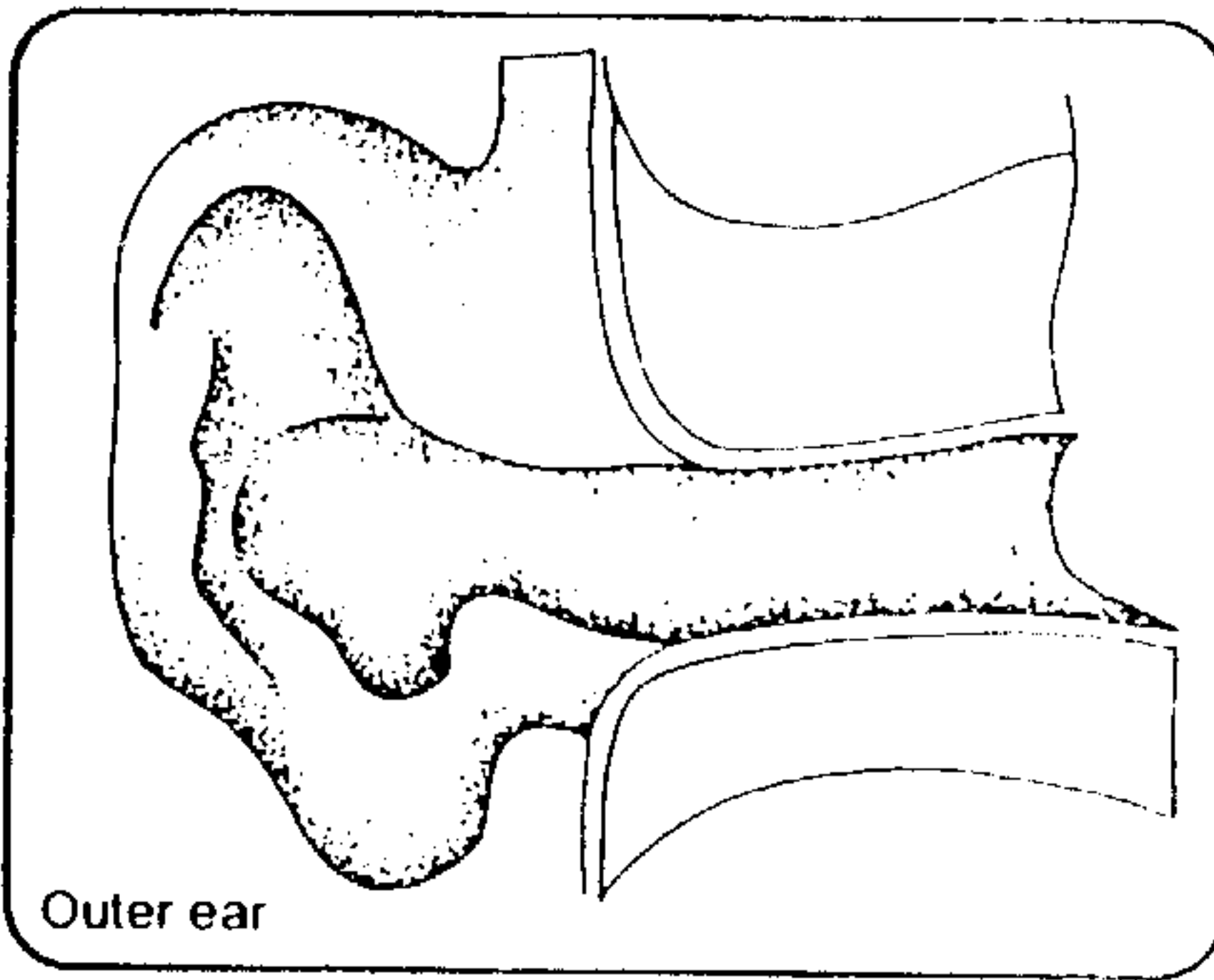
Where's that sound coming from?

The ears of a human being are about 15 cms apart. Sounds coming from one side reach one ear a fraction of a second before they reach the other ear. Because of this time difference, the brain is able to plot the direction of the sound.

Outer ear

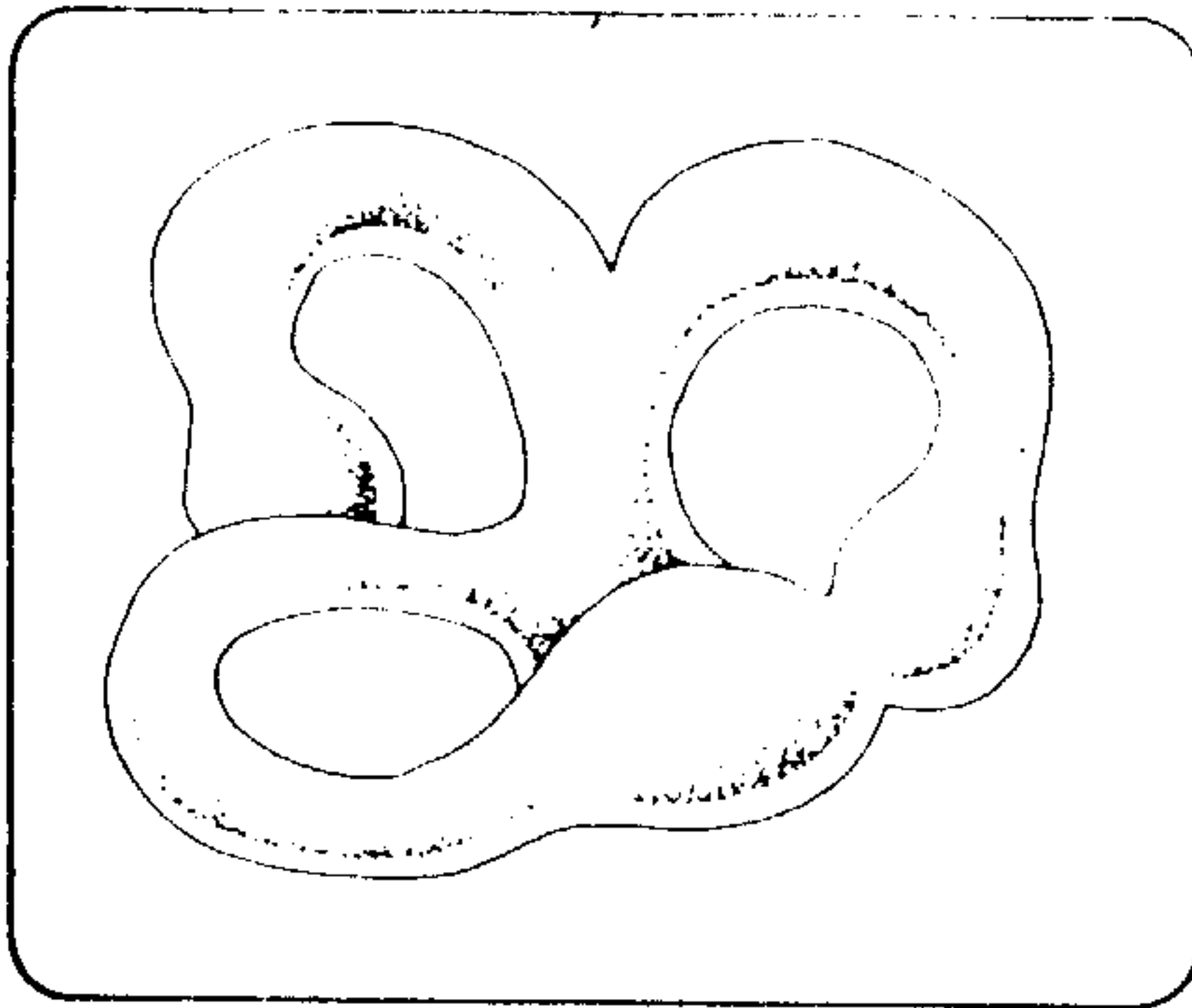
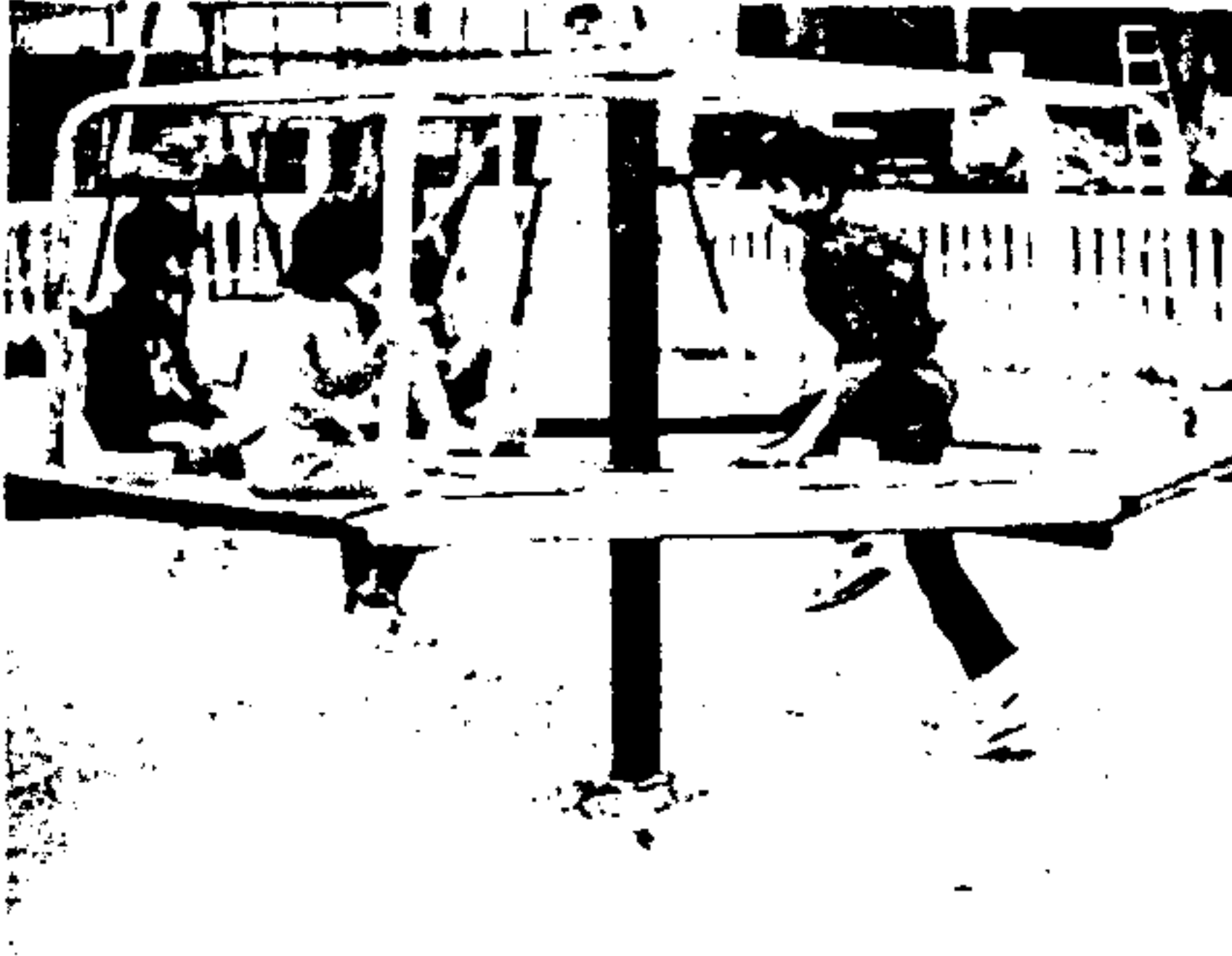
Middle ear

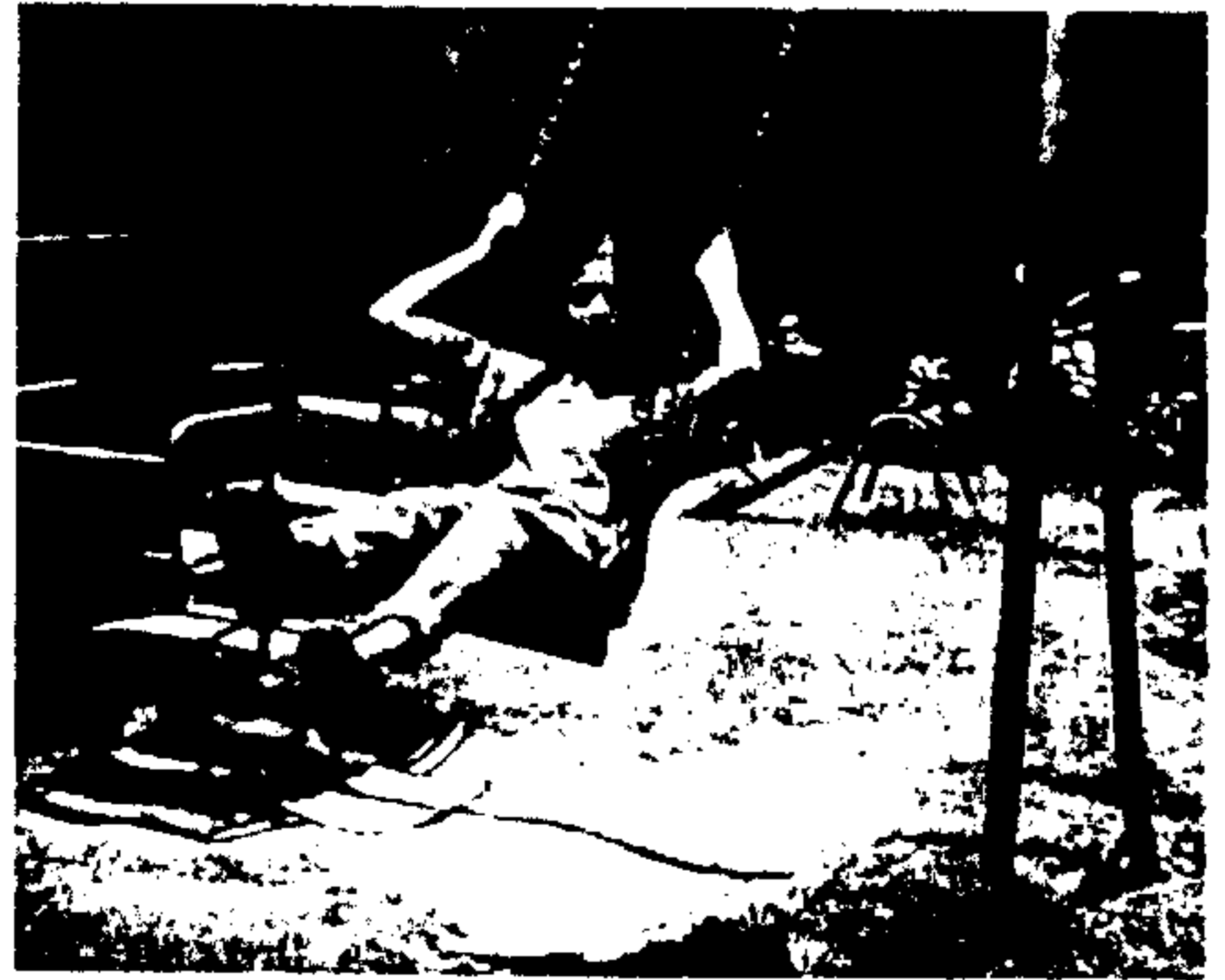
The diagram shows you that part of the ear which you cannot see from the outside

Inner ear

The membrane in your ear is called the **ear-drum**. When sound vibrations reach the ear-drum they cause it to vibrate. These vibrations are passed on to three small bones. The bones are called the **hammer, anvil,** and **stirrup**. The vibrations are passed on again, through another fine membrane, to the **inner ear.**

Finally the vibrations reach the real hearing organ. This is called the **cochlea**. From here messages about sound are sent to the brain

Balance

Have you ever felt dizzy after you have been on a swing or a roundabout? Your ears have something to do with this because they help you to balance.

Semicircular canals

At the far end of the ear there are three semicircular canals. Two stand upright and the third is horizontal. These canals, or tubes, are filled with liquid. When you move, the liquid moves too. The liquid moves tiny **receptor cells** which are at the base of the tubes. These cells send messages to the brain about which position your head is in.

When you get off a swing your body stops moving. Your eyes and muscles tell your brain that movement has stopped. The liquid in the semicircular canals does not stop moving immediately. Your brain becomes a bit confused by this and you feel dizzy.

You can learn more about sounds in Part 8.

THE EARTH

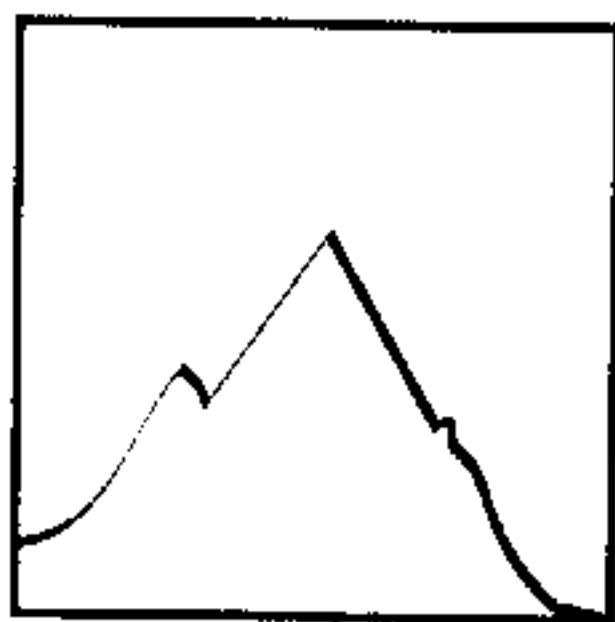
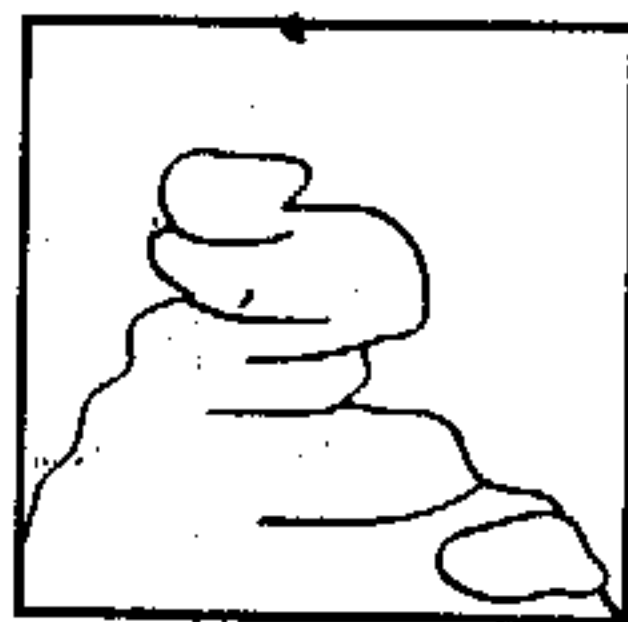
Weathering

Activity 1

Put some soil on a flat surface and fan it with the cover of your notebook. Observe what happens.

Activity 2

Make a small mound of soil in the playground. Pour water on it, and observe what happens.

Weathering is the process by which large rocks are broken up over a very long period of time into smaller and smaller rocks.

mountain

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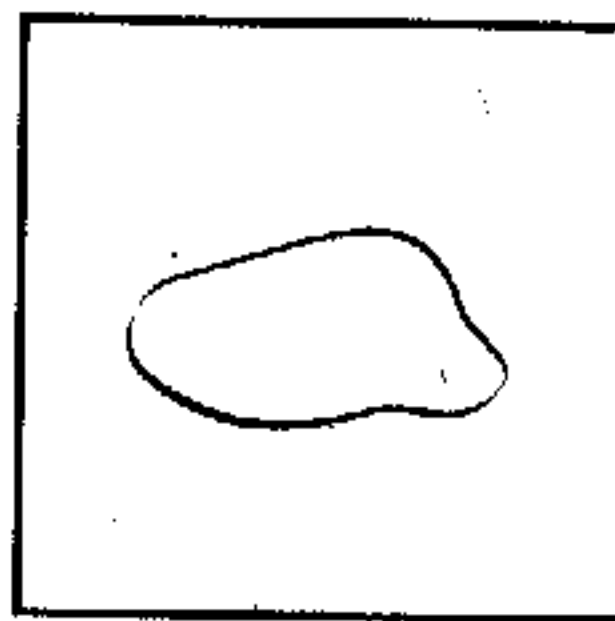
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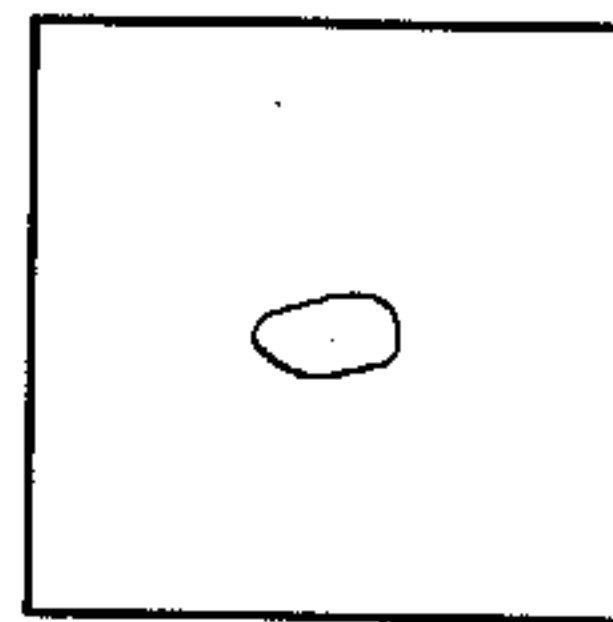
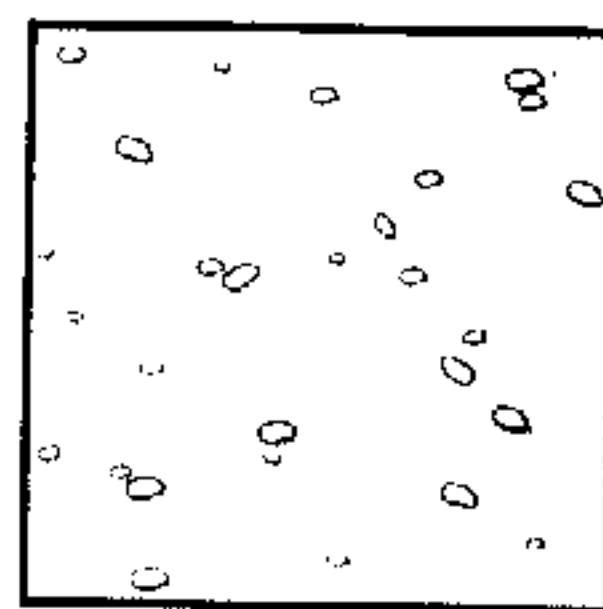

pebble

gravel

The Main Agents of Weathering

Temperature Changes: Water (from rain or snowfall) seeps into the cracks between rocks. When this water freezes, its volume expands. Rocks crack under the pressure. The Sun's heat also causes rocks to expand in the day. Rocks contract at night when the temperature falls. This expansion and contraction gradually breaks up rocks.

Activity 1

Equipment: Two stones, a tong, a stove, a hammer, some water.

Method: Hit a stone with the hammer. Does the stone break easily? Heat the other stone. Now pick this stone up with a tong and put it into the water. Take it out after a while and hit it with the hammer. Does it break easily? Which stone was easier to break, the first one or the second?

Chemicals: Chemicals break up rocks. Carbon dioxide, for example, mixes with the moisture in air to form carbonic acid. This falls as rain and breaks up rocks. Nitrous oxide is a gas which is released by factories and cars. When this mixes with the moisture in air and falls as acid rain, it breaks down rocks and also causes great harm to the environment.

Plants and Animals: A growing plant has great strength. When it takes root in the cracks between rocks, the force of its roots break the rocks apart. When animals dig to make their houses, they throw out soil and stones and create tunnels underground.

Erosion

Erosion is the wearing away of rock which has been broken up by weathering. Agents of erosion include rivers, seas and oceans, wind and glaciers. Erosion wears away the fertile layer of soil that is found on the surface of the Earth. This layer of soil, which is useful for agriculture, is called topsoil.

Activity 1

Equipment: Sand, a tray, some water.

Method: Make a model of a hill in the tray. Pour some water on this hill. What happens?

This is how water carries the topsoil with it. The amount of erosion that takes place depends upon the slope, type of soil and the speed and quantity of the water.

Water (rivers, waterfalls, seas and oceans): The force of running water washes away rocks and soil from the banks of rivers. Waterfalls cut away at the rocks near their base. Ocean and sea waves lap against the coast, breaking down cliffs over a very long period of time.

Wind: Strong winds, particularly in the desert, carry away great amounts of sand. They also wear away large rocks.

Glaciers: These huge cliffs of ice weigh a great deal. Their slow but gradual movement down mountain slopes wears away river beds and the sides of valleys. They also carry a lot of debris with them.

Protecting Soil from Erosion

1. Prevent over-grazing. If animals like goats and sheep are allowed to graze in a particular area for too long, there are no more trees or roots that can hold the soil in place.
2. Protect trees and plants. The presence of trees and their strong roots hold the soil in place, even during heavy rains.
3. Replant new trees. Where we have cut down trees for paper, furniture and buildings, new trees should be planted immediately. Deforestation is a serious environmental problem. Deforestation refers to the large-scale felling of trees. Once the trees and their powerful roots no longer hold the soil in place, the most fertile layer of soil (i.e. the topsoil) is washed away. The remaining soil is not very fertile and very little can grow in it.

Deposition

When the agents of erosion carry away soil and rock particles, they eventually deposit them elsewhere. Deposition is the process by which rock debris is deposited by agents of erosion. Sometimes this deposition is on such a large-scale that large mounds of rock called moraines are formed.

Summary

Weathering, erosion and deposition together change the surface of the Earth. The erosion of valuable topsoil is a serious environmental concern.

CHANGES ON EARTH

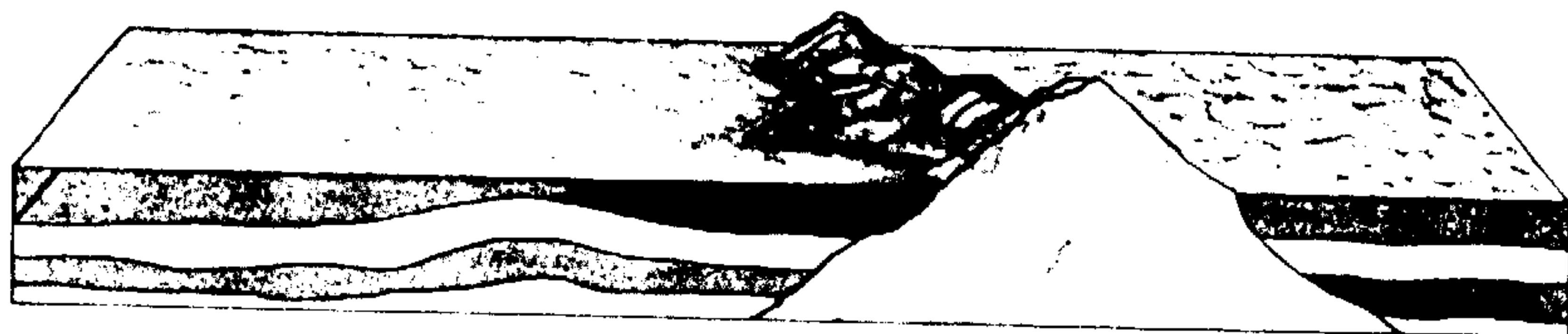
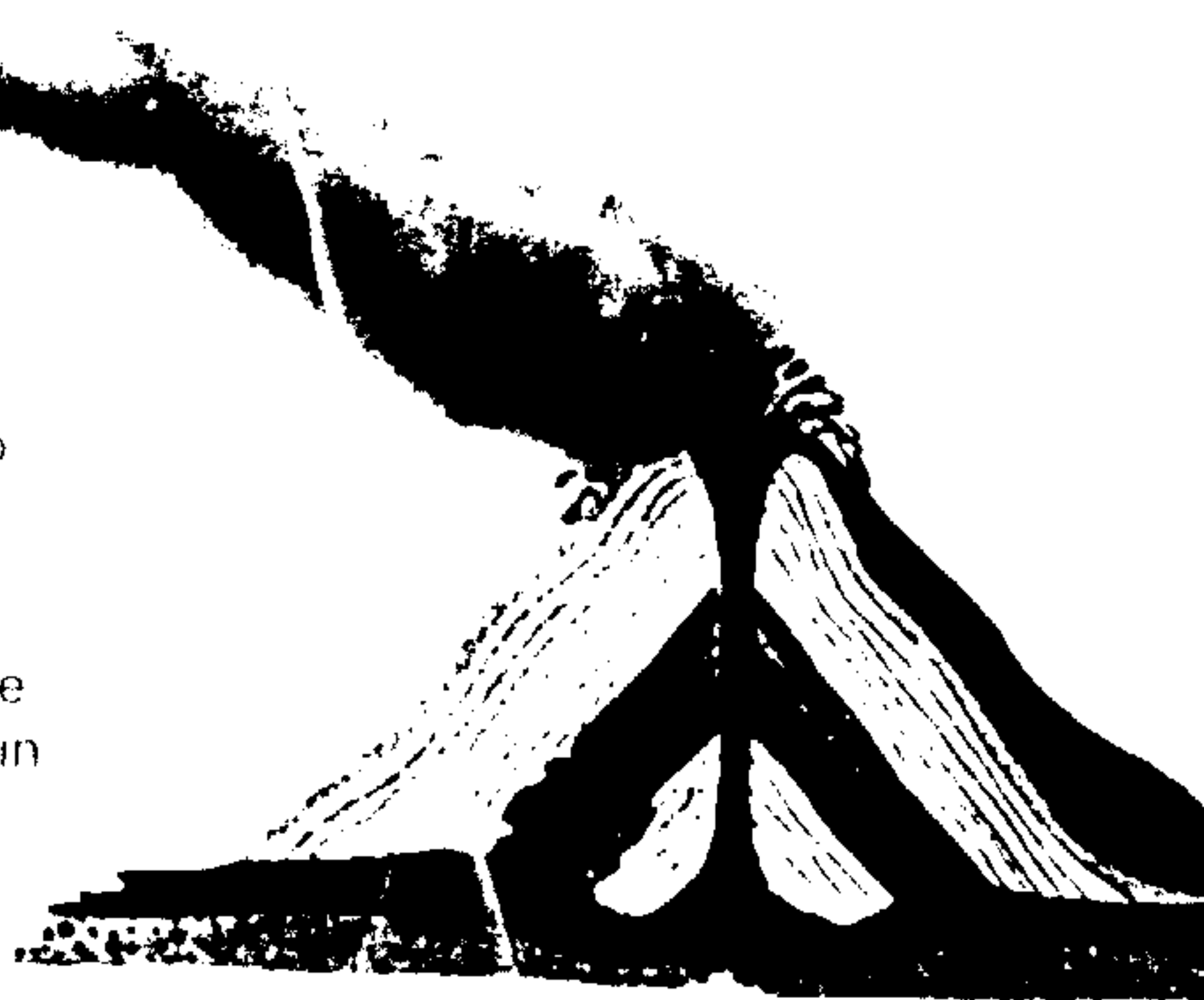
Rocks

Our Earth is about 4 600 million years old. Scientists know this because they have been able to study rocks. They use an instrument called a **mass spectrometer** to find out how long ago certain rocks cooled and became solid.

On the surface of the continents the rocks are quite young. Deep below, the rocks are much older. Rock is formed in different ways.

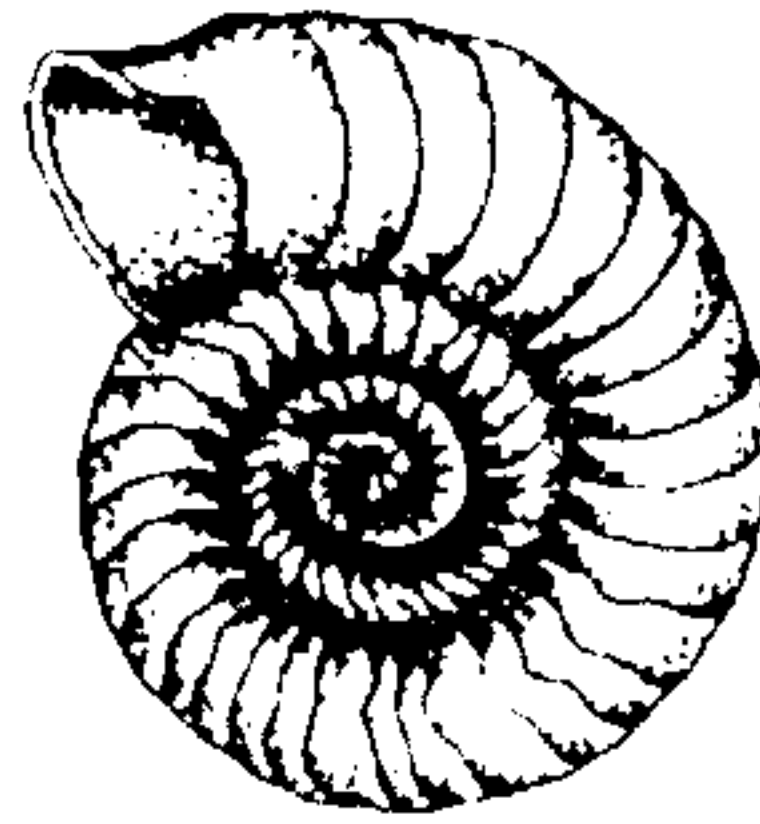
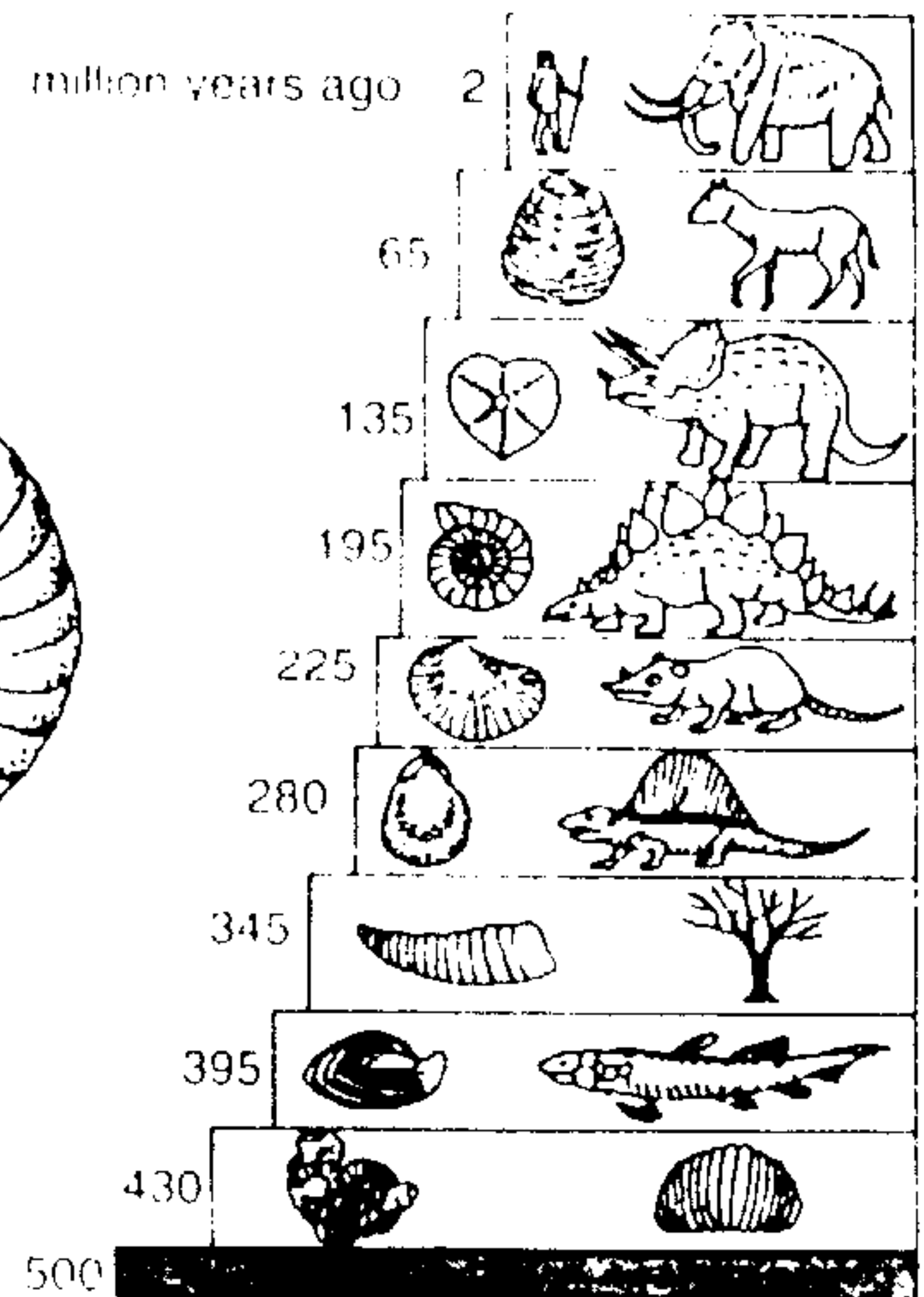
Igneous rocks are formed from hot molten rock called **magma**. When magma reaches the surface and comes out through a volcano it does so in the form of **lava**. Some of these volcanic rocks are formed from the ash which comes out of a volcano. Basalt and pumice are examples of volcanic rocks. Magma that has cooled below the surface of the ground forms granite. We find granite on the surface, too. But this is because the other rocks which once covered it have worn away.

Sedimentary rocks were formed by sediment being deposited in one place. These include limestone, sandstone and shale. Coal is also a sedimentary rock. It consists of plant remains which have been pressed together.

Metamorphic rocks are those which formed, but were later altered, by heat (from magma) and pressure. They include marble (which was formerly limestone) and slate (which was formerly shale).

Life on Earth

People only appeared on Earth about two million years ago. The first plants and fish appeared during the period lasting from 570 to 225 million years ago!

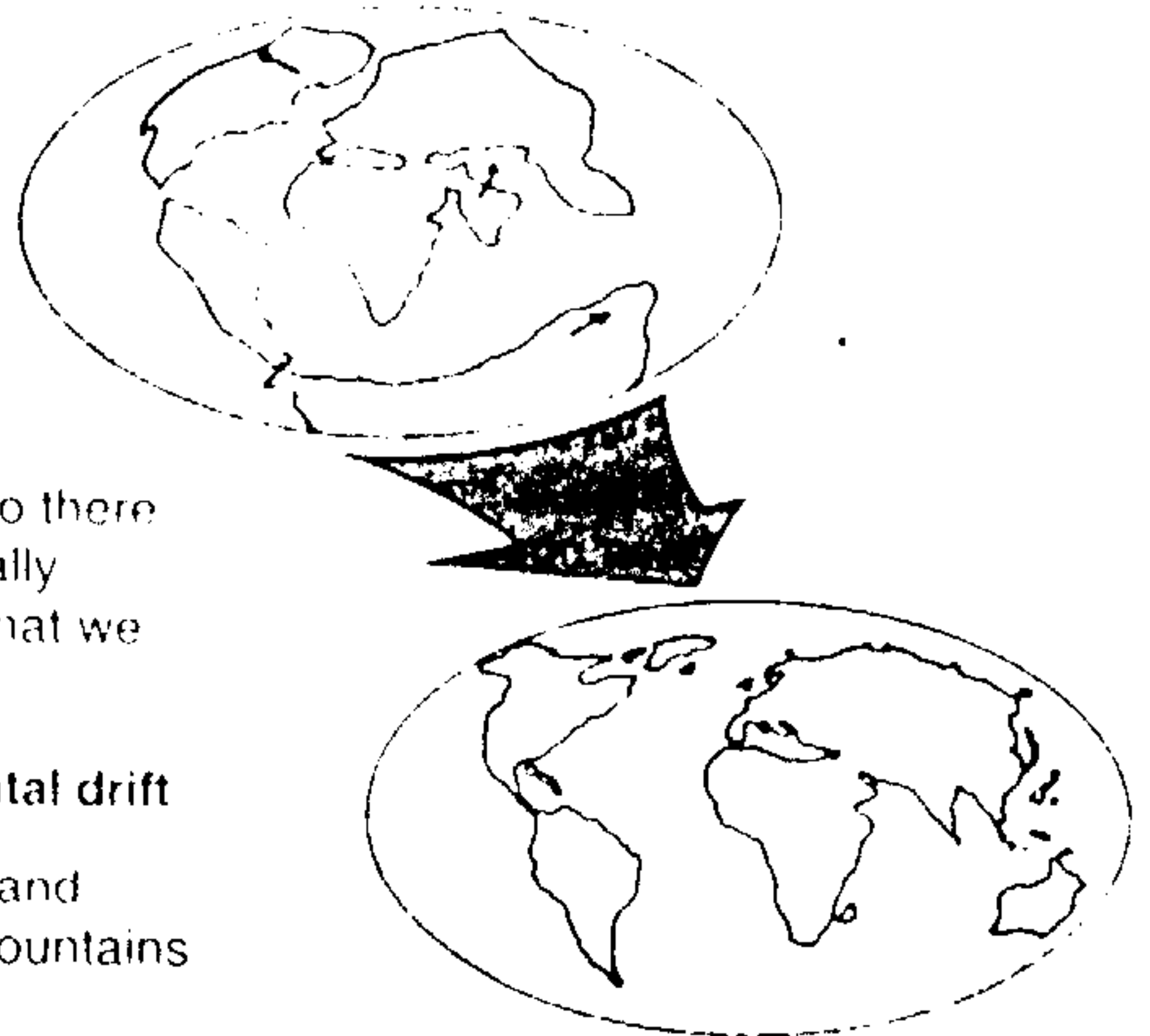
Fossils

Fossils are important because they help scientists decide when certain creatures lived on Earth. They are also important because they help us to tell the date of rocks. Many species only lived for a short period before they became extinct. So, by studying what fossils there are in two different kinds of rock, we can tell whether they were formed at the same time or not.

Fossil

Scientists have already found the fossils of more than 200 000 extinct animals.

Continental drift

Alfred Wegener was a German scientist who collected information about rocks and fossils from different continents. His work helped modern scientists to form a theory that all the continents were, at one time, joined together. About 200 million years ago there was a single land mass. This gradually drifted apart to form the continents that we know today.

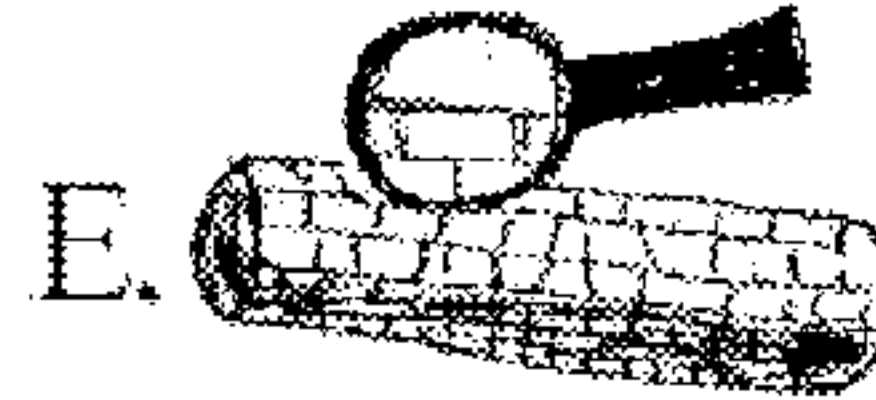
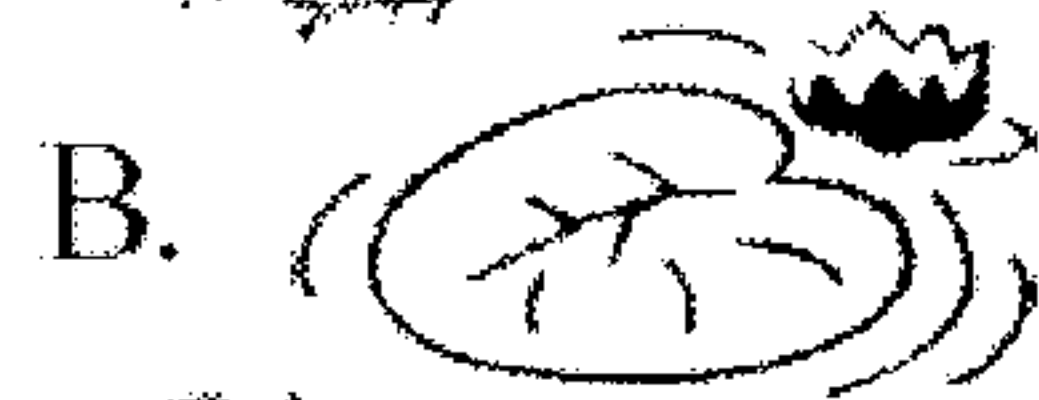
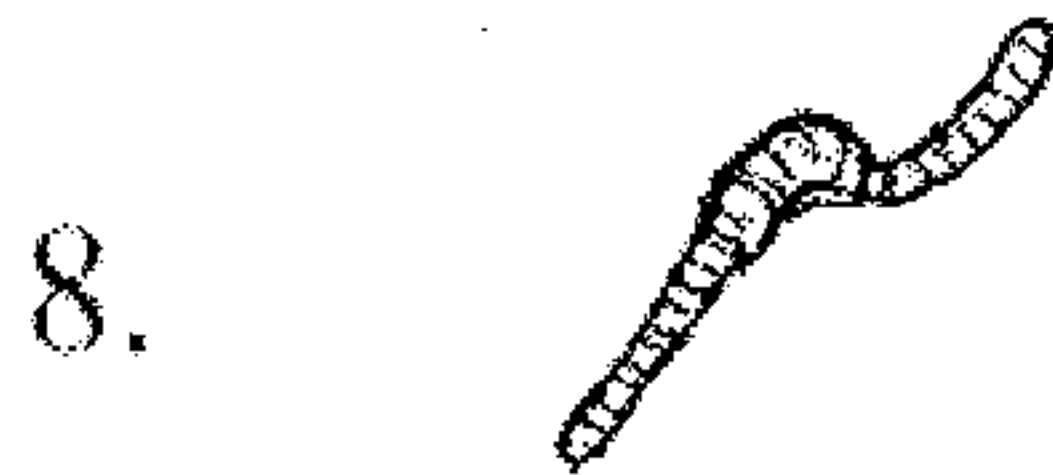
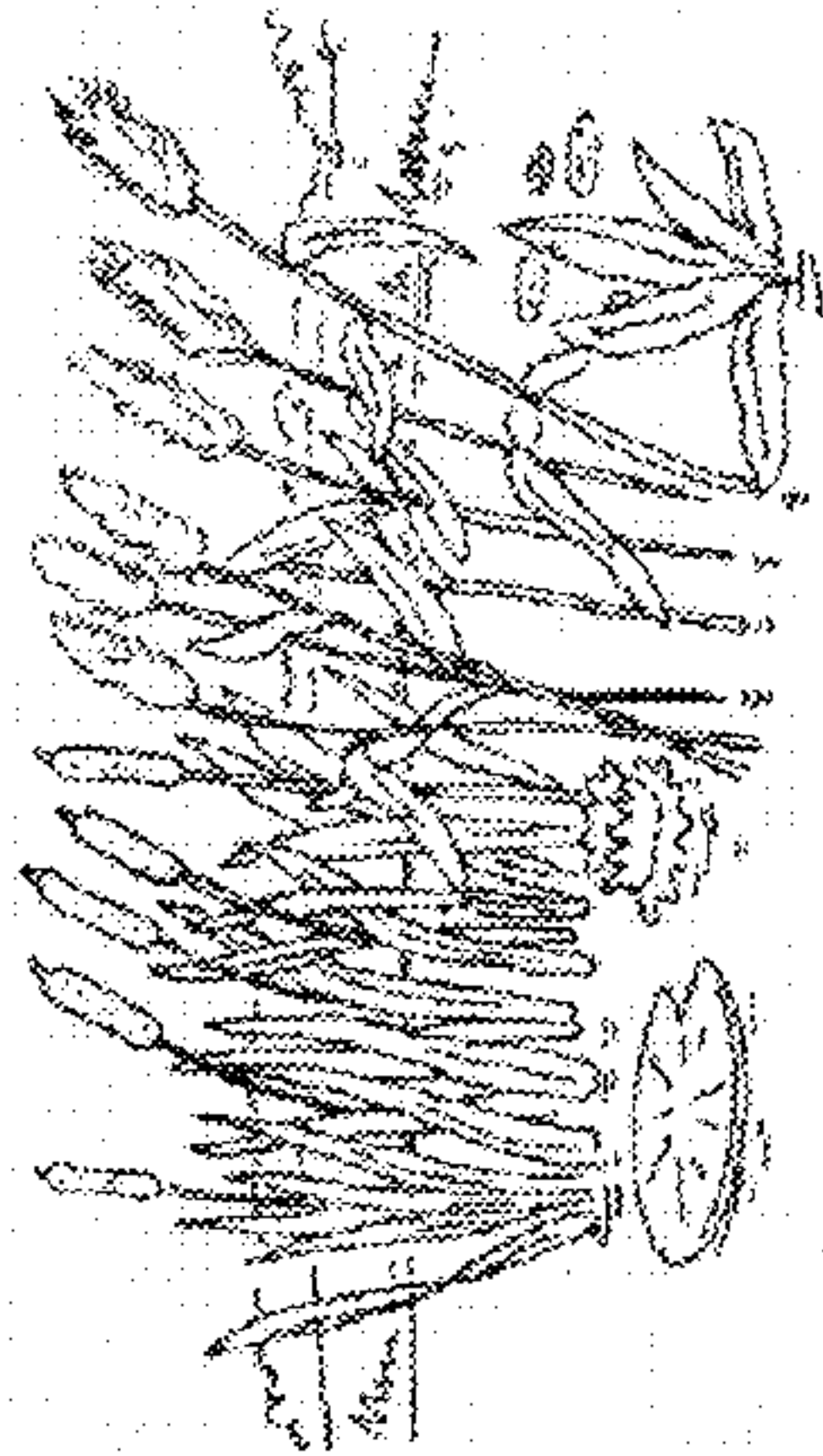
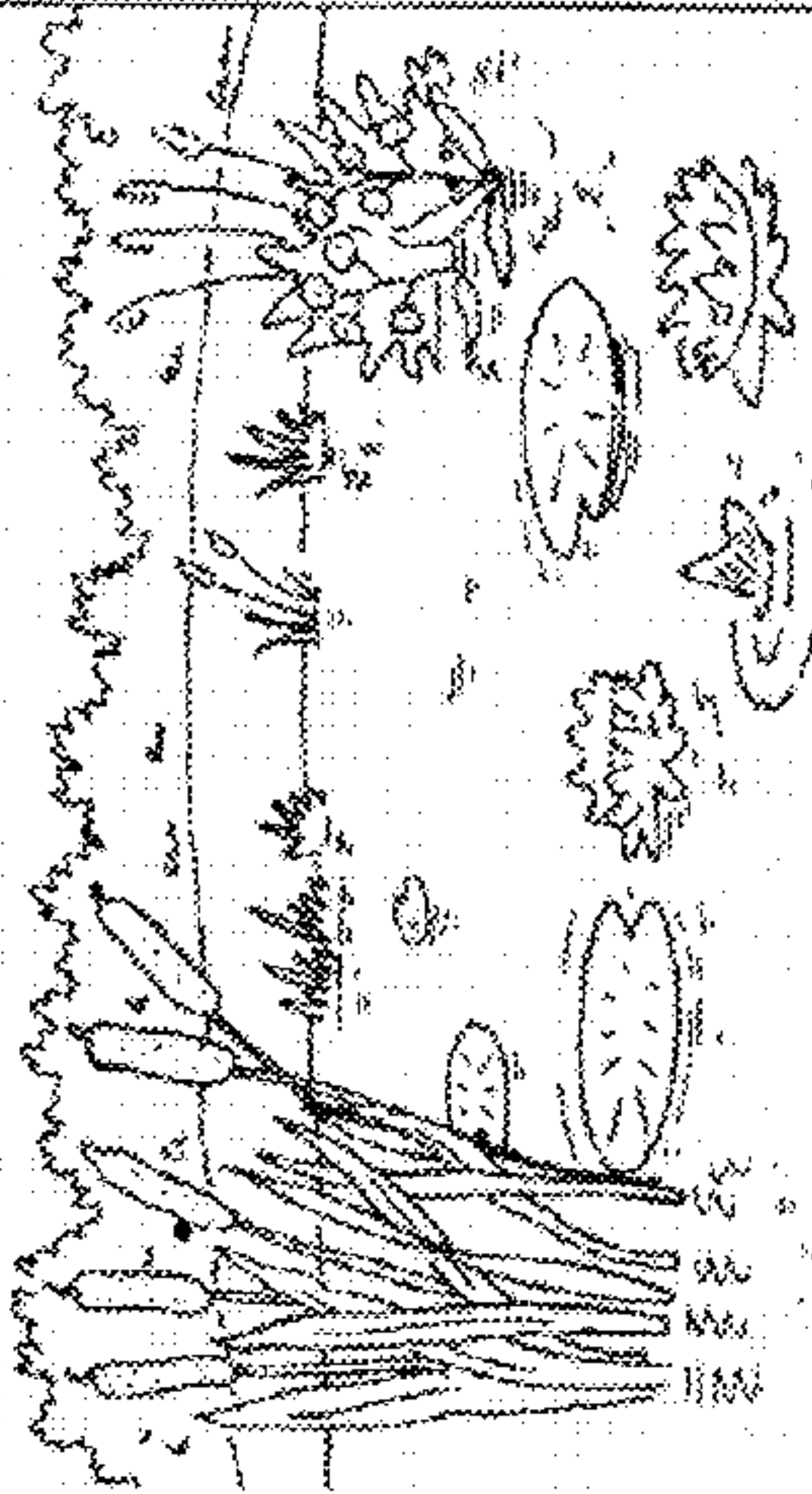
This motion is known as the **continental drift**.

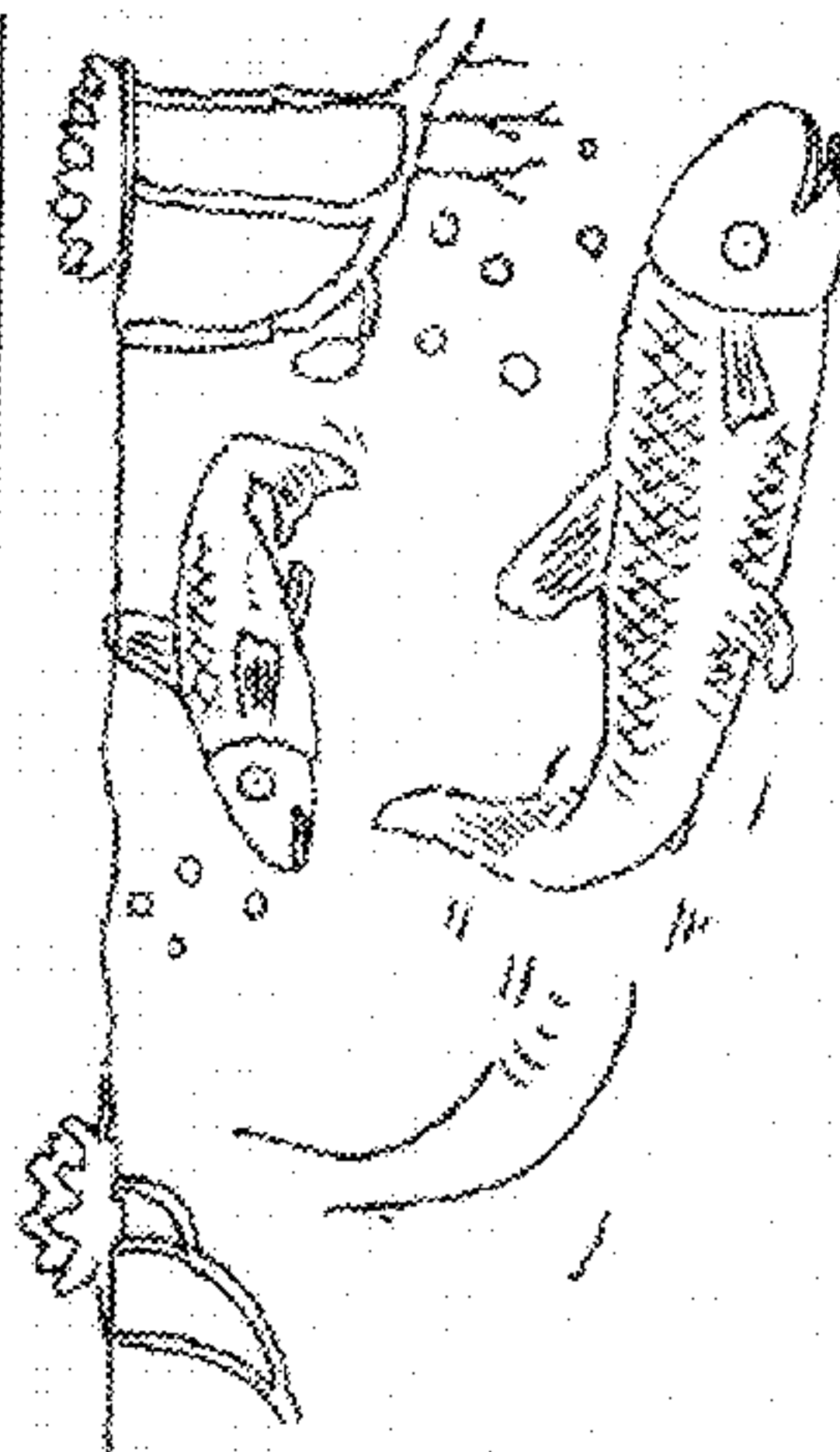
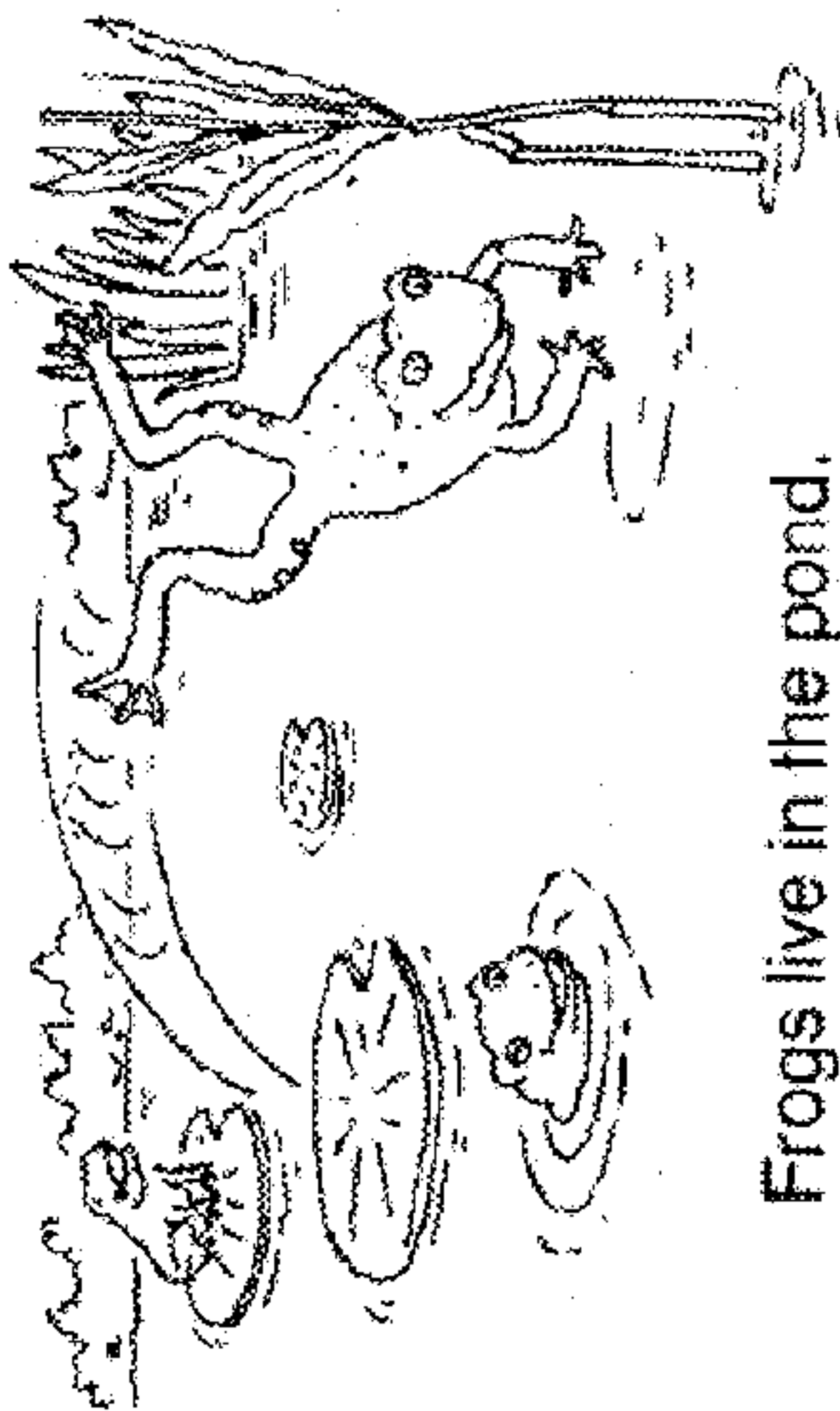
It helps to explain why earthquakes and volcanic eruptions occur and how mountains are formed.

Science Worksheets

Level 4

Level 4　　Term 1　　Week 1　　Day 4

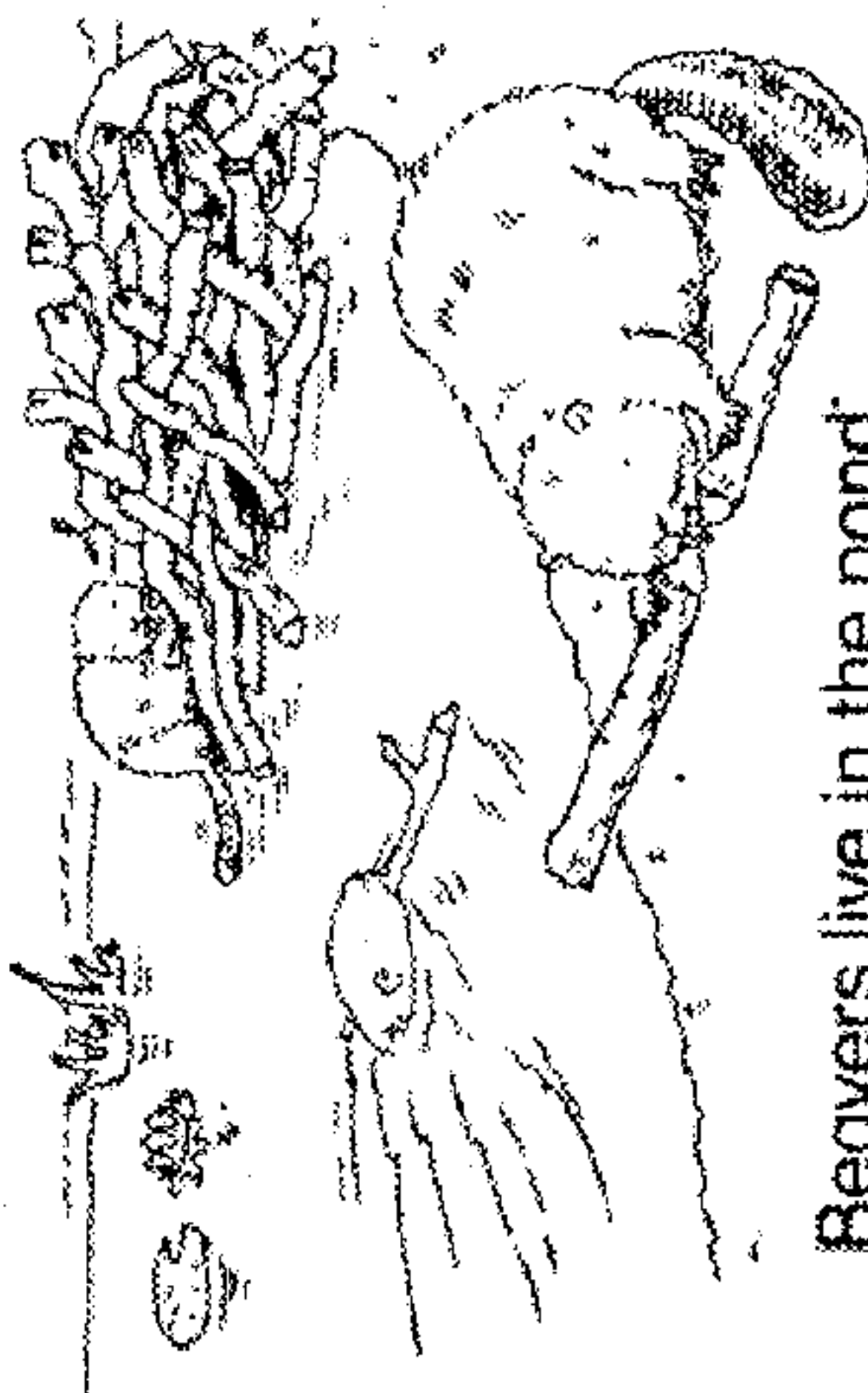
Habitat matching Worksheet

Match the animals with their habitat by drawing lines.

Level 4 Term 1 Week 2 Day 2

Worksheet

Frogs live in the pond.
They hop and croak.

4

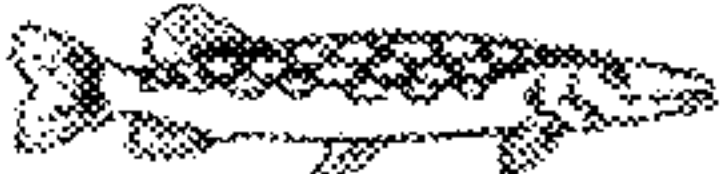
Salamanders live in the pond.
They scurry and hide.

5

Beavers live in the pond.
They build and chew.

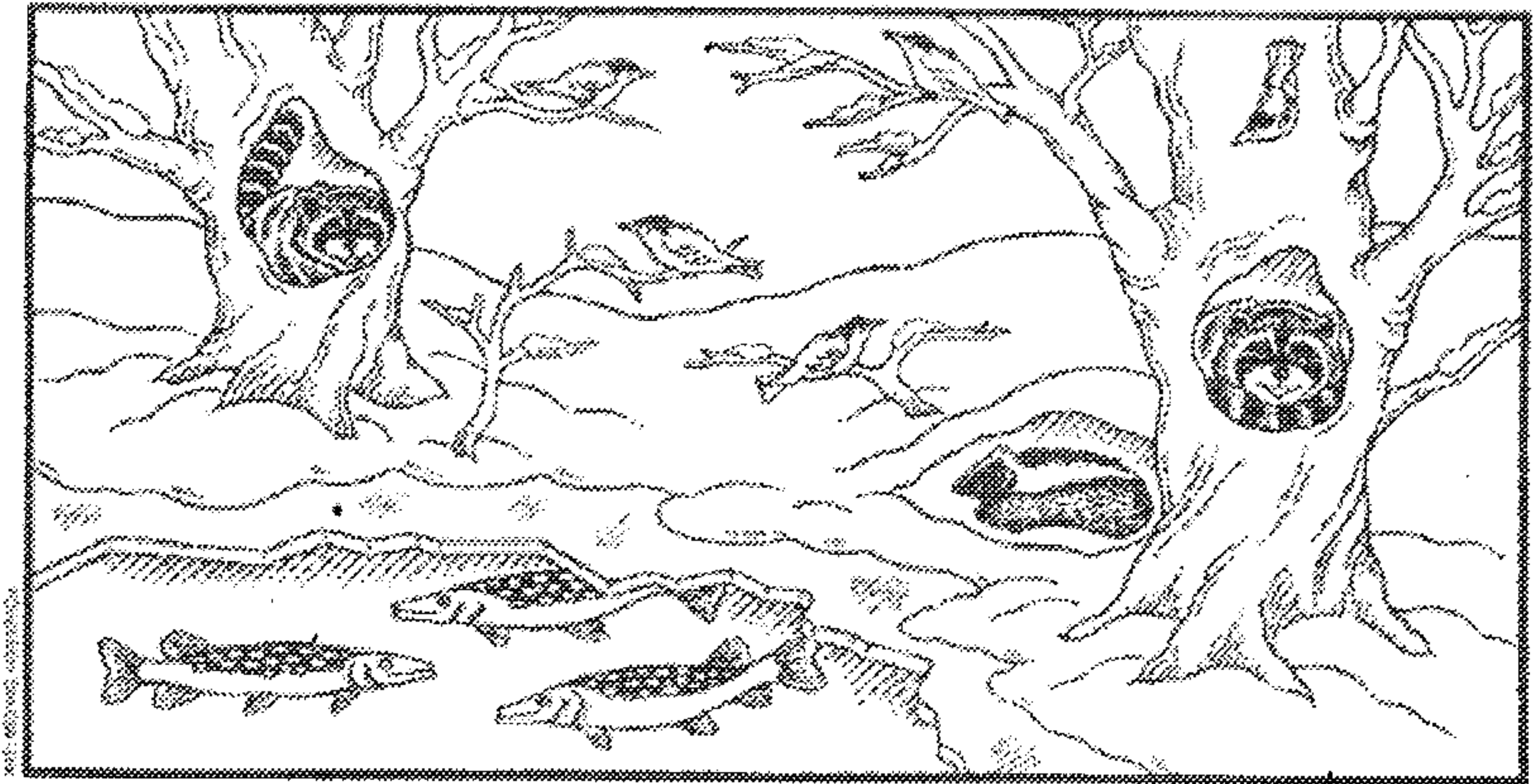
6

They all live in the pond together.
That's what they do!

7

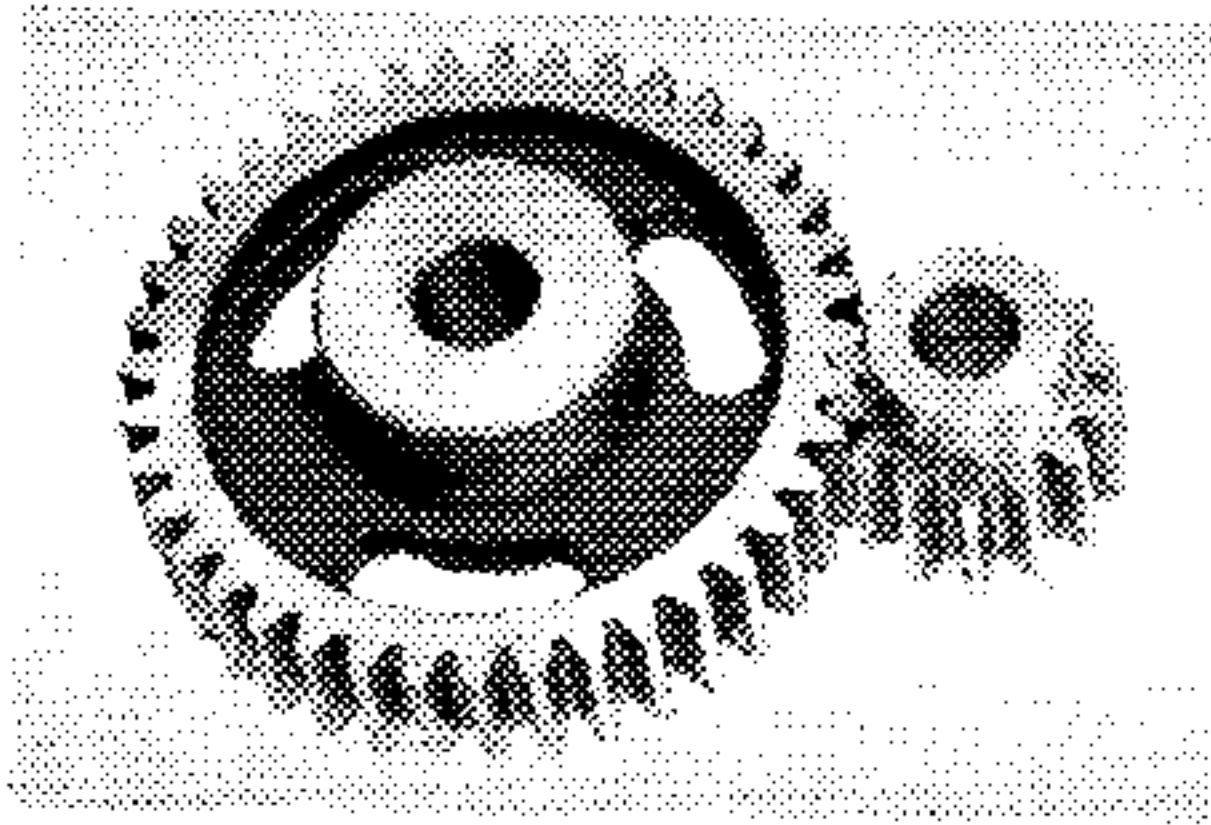
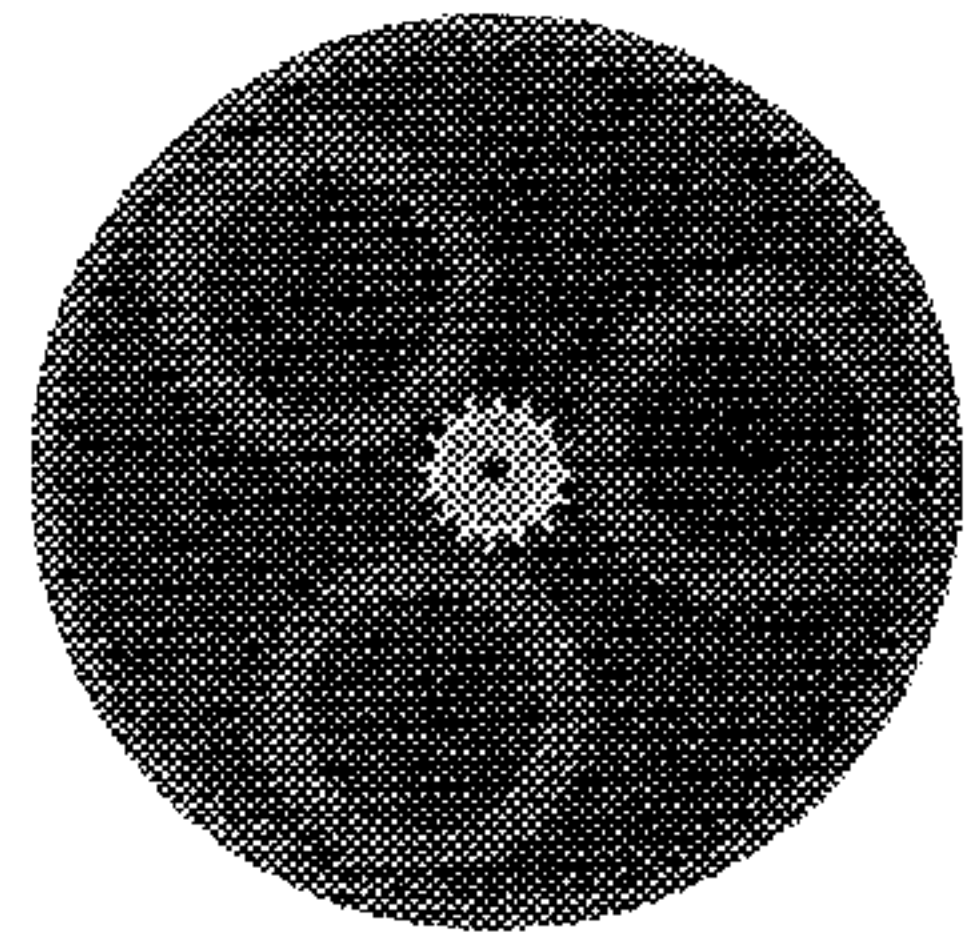
Level 4 Term 1 Week 3 Day 1

Who lives where? (Forest Worksheet No 1.)

Name_______________________________

Find the Animals

Use the illustration above to fill in the graph. We did the first one for you.

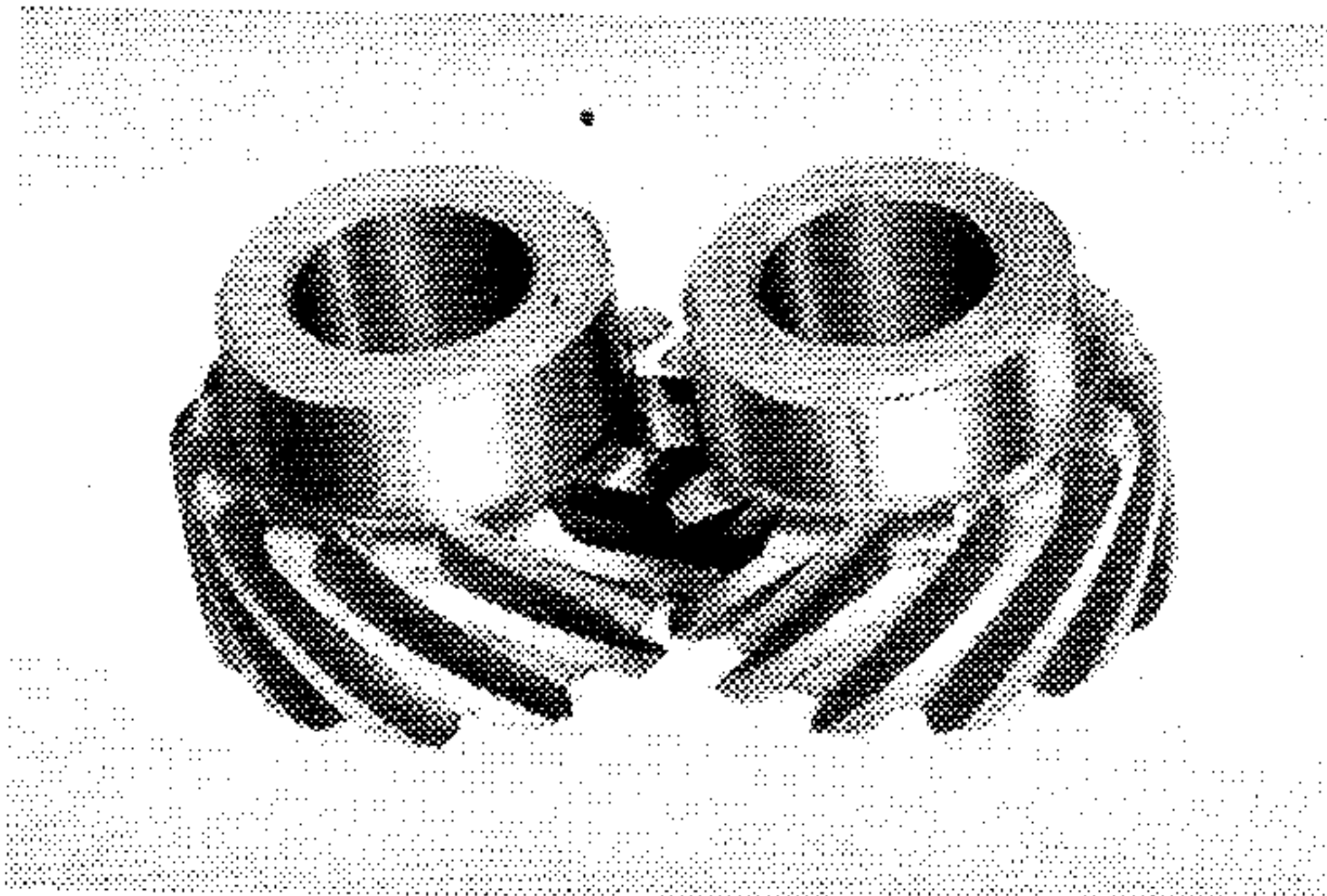
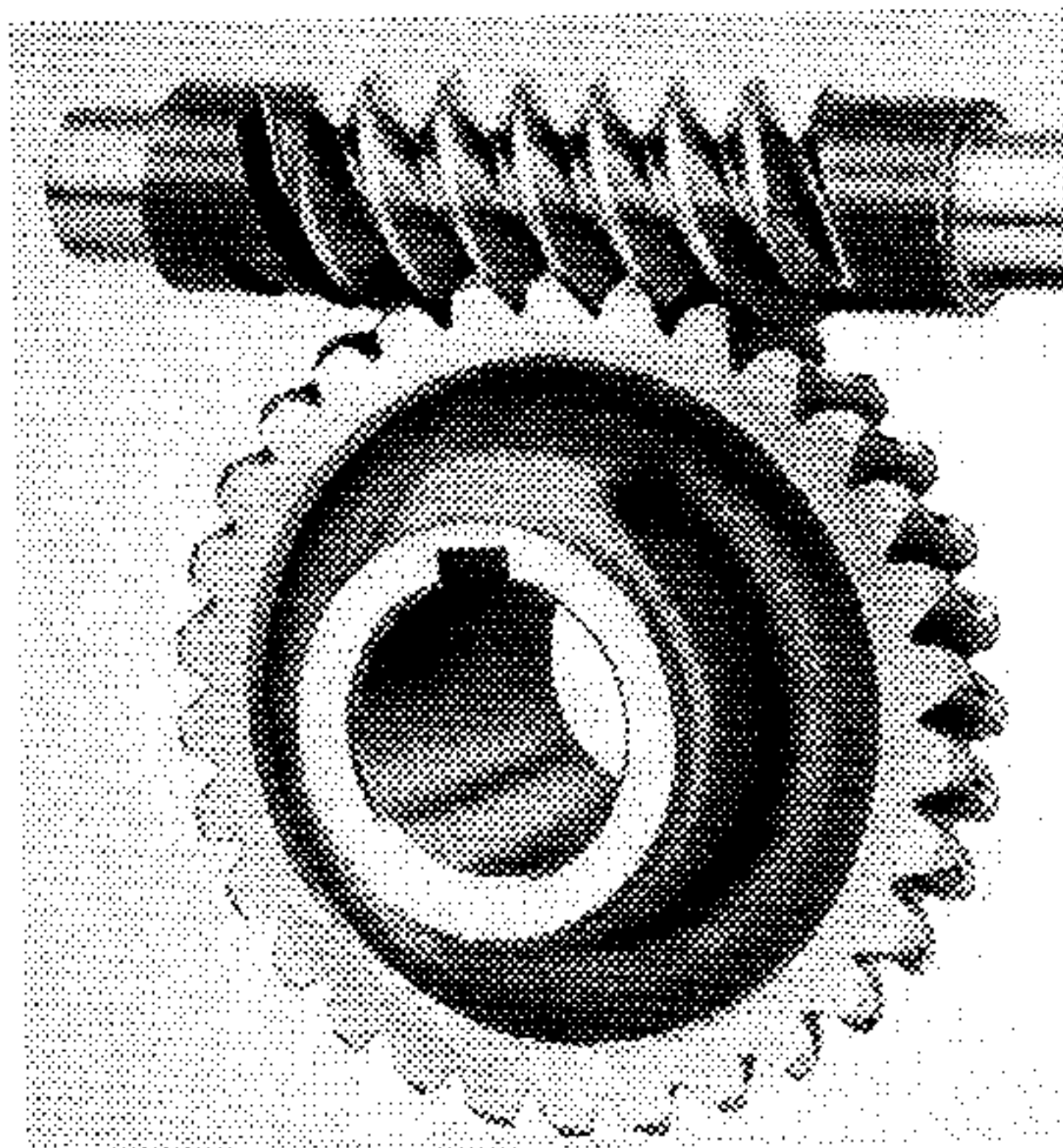
5				
4				
3				
2				
1	■			
	skunks	birds	raccoons	fish

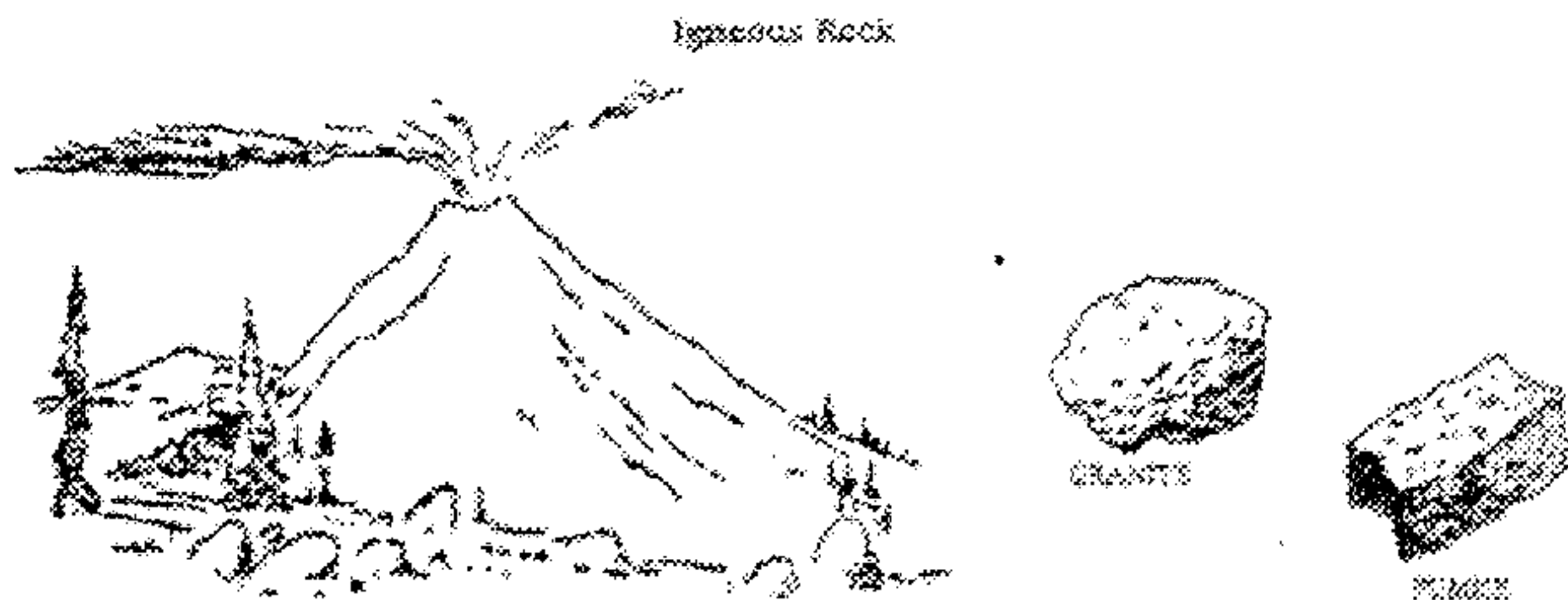
Level 4 Term 3 Week 6 Day 3

Types of Gears (worksheet No 1)

Spur gears

planetary gear

Helical gears

Worm gear

Level 4 Term 4 Week 3 Day 3 (Igneous Rocks Worksheet)

Name________________________ Date_________________________

Look at this picture and answer the questions.

Q 1) Igneous rocks form by

a) Cooling of magma and lava

b) Ashes from the volcano

Q 2) Volcanic rocks form by

a) Ashes from the volcano

b) Cooling of magma and lava

Q 3) Igneous rocks are

a) Hard

b) Soft

Q 4) Granite is

a) Igneous rock

b) Volcanic rock

Q 5) Pumice is

a) Igneous rock

b) Volcanic rock